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SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, 1952

No. 28

UNITED STATES OF AMERICA, ON THE RELATION OF OSCAR L. CHAPMAN SECRETARY OF THE INTERIOR, PETITIONER

vs.

FEDERAL POWER COMMISSION AND VIRGINIA ELECTRIC AND POWER COMPANY, ET AL.

~~No. 29~~

THE VIRGINIA REA ASSOCIATION, ET AL., PETITIONERS

vs.

THE FEDERAL POWER COMMISSION AND VIRGINIA ELECTRIC POWER COMPANY, ET AL.

ON WRITS OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FOURTH CIRCUIT

PETITION FOR CERTIORARI FILED MARCH 18, 1952
CERTIORARI GRANTED MAY 5, 1952

Appendix to the Brief on Behalf of Respondent Virginia Electric and Power Company

This Appendix prints portions of the Examiner's Decisions of March 17, 1950, and November 15, 1950, not printed in Petitioners' Appendix.

Certain omitted Exhibits and portions of omitted Exhibits are printed.

In printing extracts from the transcript of the hearing, some of Petitioners' Appendix is duplicated in order to present the relevant material within more useful dimensions than the 1,044 pages of Petitioners' Appendix.

In the printing of portions of the Examiner's Decisions and of exhibits, italicized page references are to internal pagination.

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EXAMINER'S DECISION OF MARCH 17, 1950

[R. 5423; *8*] The public hearing ordered by the Commission was concluded on June 16, 1949. All parties, including the Commission's Staff, and the Secretary of the Interior, were given full opportunity to present evidence and to participate properly in examination and cross-examination of witnesses as well as to present their views and such objections and motions as they desired to lodge. All parties including the Staff and the Secretary of the Interior have filed comprehensive briefs.

* * *

[R. 5444; *29*] * * * This Commission is the creature of the Congress and exercises a segment of legislative authority by express delegation and authorization. Certainly, it is farthest from our inclination or desire, to obscure or flout by specious reasoning or verbal hair-splitting, the true legislative intent. In connection with the comprehensive plan submitted by the Army Chief of Engineers, for the Roanoke River Basin, Congress used the word "approved". In connection with two multi-purpose projects in that plan, Buggs Island and Philpott, to be appropriated for, Congress used the word "authorized". The Applicant and those who support its view, contend that the two words are not synonymous in meaning and that Congress did not intend that they be considered so. Those opposing the application, contend that, in legal effect, the two words have the same meaning and are interchangeable. On the one hand, they say that if the words were not meant to convey the same meaning and legal implications, if Congress did not contemplate long range development by the United States of each and every unit therein contained, what purpose could that body have had in approving the comprehensive plan? On the other

hand, say the proponents of the application, surely Congress did not intend that such of the public benefits from these valuable water resources as it did not desire to develop and utilize immediately or in the near future should be unrealized and the water wasted to the sea for an indefinite period.

* * *

[R. 5447; *32*] The hearings before the Committee on Public Works, House of Representatives, 81st Congress, 1st Session, on Title II of the Flood Control Act of 1949, brought out interesting and informative material [R. 5448; *33*] on this question. The portions of the hearings of greatest interest so far as this case is concerned are those on bills seeking authorization for the Hartwell project on the Savannah and Smith Mountain on the Roanoke, which, as has been pointed out, are units of Army-conceived comprehensive plans for the river basins involved, such over-all plans having been "approved" by Congress but only partially authorized in the same manner. Appearing at these hearings at the request of the Committee of the House, was Major General Lewis A. Pick, Chief of Engineers, Department of the Army, and Lt. Col. Herbert C. Gee, Deputy Chief of Civil Works for Flood Control of the Corps of Engineers, designated by General Pick as Official spokesman for the Corps. The statements of the members of the Congressional Committee and these high Army officials are illuminating and very pertinent. Observe the following, quoted from their statements:

STATEMENT OF MAJ. GEN. LEWIS A. PICK, CHIEF OF ENGINEERS, UNITED STATES ARMY[1]

GENERAL PICK. * * * I am honored to appear before you * * *. * * * I am prepared to make a general statement * * * and my assistants from the civil works division of my office will be prepared to furnish you with information on individual projects and on other matters which this committee may desire to consider in connection [R. 5449; *34*] with the flood control program. * * * Colonel Gee, who will testify specifically on the individual projects and basins * * * will be available to answer any questions and to assist the committee. * * *

* * *

[R. 5451; *36*]

Roanoke River, Smith Mountain Dam, Va.

MR. DAVIS. (Acting Chairman) Colonel Gee, will you present this project? May I say at the outset that Mr. Dondero may be interested in the development of this project. I am informed that in view of discussion on the Clark Hill project yesterday and the Hartwell—it is expected that the eight or nine dams for power purposes in the Savannah River are very likely to be utilized by private industry and I think Mr. Dondero should get some satisfaction out of this, and I say that with all deference to everybody concerned. If the Federal Government is under obligation to assume a greater share of the expense in providing for a multipurpose service up the river, then after that has been done, down the river, say in these 9 cases, private industry could then come in and build the power establishments to take

[1]Hearings before the Committee on Public Works, House of Representatives, 81st Congress, 1st Session on H.R. 5472 (Title II) authorizing the construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control, soil conservation, and for other purposes (Flood Control Act of 1949), May 16 - June 2, 1949.

care of the needs of that area. I think we are getting [R. 5452; *37*] somewhere. And that was developed, Mr. Dondero, in the statements yesterday, when the first two projects Clark Hill and Hartwell are developed, the excess cost maintained by the public at large provides an opportunity for private industry to go ahead and proceed in an orderly way under our system of private enterprise.

* * *

MR. DAVIS. * * * Colonel Gee, will you please proceed?

COLONEL GEE. Mr. Chairman, there are two bills * * *.

* * *

MR. DONDERO. Do I understand that this explanation you are making, Colonel, is in relation to the Smith Mountain Dam proposal before us this morning?

[R. 5453; *38*]

COLONEL GEE. That is correct, sir.

MR. DONDERO. In other words, you mean to say that private power companies have made application for the right to build these dams and construct the necessary power facilities rather than the Federal Government?

COLONEL GEE. Yes, sir; the Roanoke Rapids.

MR. DONDERO. Part of the Roanoke River Basin.

COLONEL GEE. One of the 11 recommended and now approved plans for the basin, sir.

MR. DONDERO. What is the other one you mention?

COLONEL GEE. The Gaston site, sir.

* * *

MR. PICKETT. I understand in the over-all comprehensive plan that you have proposed 11 reservoir structures, only three of which have any part of their purpose to be flood control.

COLONEL GEE. That is correct, sir.

MR. PICKETT. And those three are Philpott, Buggs Island, and Smith Mountain.

COLONEL GEE. Yes, sir.

MR. PICKETT. Smith Mountain is the one presently under consideration, and you have under authorization and construction both Philpott and Buggs Island.

COLONEL GEE. That is correct, sir. * * * We would be remiss in our duty as engineers serving the Congress if we did not point out to you the potentialities of the Roanoke River Basin. We have said in the report that the building of 3 of these 11 projects will produce all of that flood control which we believe to be economically justified, that the remaining 8 are straight power projects, and if it is desired that power projects be built by the Federal Government, we believe these are the sites [R. 5454; *39*] best adapted to that purpose, and this is approximately what it will cost to develop the full capabilities of that river basin.

* * *

MR. ANGELL. Is the Federal Government at the present time planning to develop any of those dams on the lower part of the river which are devoted exclusively to power production?

COLONEL GEE. No, sir. They have the same status in this basin plan as the eight remaining projects. They are part of the approved plan. Their being in that plan certainly is no bar to a private utility company coming in and seeking to develop one of these projects.

MR. ANGELL. And that is what is being done now.

COLONEL GEE. That is being done now at Roanoke Rapids, sir.

* * *

[R. 5455; *40*]

MR. PICKETT. Colonel, assuming that some presently existing utility company should appear at the Power Commission and now make an application to construct

the Smith Mountain Dam, what would be the attitude of the Corps of Engineers on it?

COLONEL GEE. The Corps of Engineers would be given an opportunity by the Federal Power Commission to review the plans of that utility company, and in reviewing those plans we would insist that the structure itself would do those things which we believe necessary to be done in developing the site fully; secondly, that their method of operation would not make conditions worse on the river. In other words, sudden fluctuations of water releases produce greater damage than the heavy seasonal floods on some streams. There would have to be a set of regulations included in the permit issued to this company, which would restrict their operations so that they would not do damage to property owners downstream.

MR. PICKETT. Then your position is not that of just resistance to the theory that private companies might build this structure if it conforms to the benefits of the general over-all plan that you are already in the process of developing; is that right?

COLONEL GEE. That is correct, sir.

MR. PICKETT. Thank you.

* * *

[R. 5457; *42*] The attitude and understanding of the department of the Army respecting the intent of Congress and the meaning of the Flood Control Act of 1944 can be seen clearly in the statements of its official spokesman. The Department of the Army's Corps of Engineers—the agency entrusted by Congress after Congress and session after session down through the years with the task of investigating and surveying and submitting recommendations for important river and harbor improvements and continuously through the years charged with the task of executing many of the laws of Congress with respect to construction, operation, and main-

tenance of such improvements—thus working closely and intimately year by year with the Committees of Congress in charge of such matters—has opportunity excelling that of all others to learn and to know the intent of the legislative body and the true interpretation and meanings of the words customarily and by practice used by Congress in the bills and acts dealing with the surveys and plans submitted by the Corps as a basis for legislation.

[R. 5458; *43*] This much is certain. The Corps of Engineers does not regard a project as "authorized" if it is only part of an "approved" comprehensive plan. Colonel Gee made it clear that so far as the Department of the Army is concerned, none of the Roanoke River units other than Buggs Island and Philpott is "authorized." Note that Colonel Gee said: "We have never construed the approval of the plan to carry with it the authorization to construct the elements of that plan", and the Chairman of the House Committee, presiding, there added, "Neither do we". As we have seen, this spokesman for the Department of the Army, Colonel Gee, also told the Committee that non-Federal development of some of the units of this comprehensive plan approved by Congress could be expected. It is interesting to note that this officer seemed to consider it within the realm of possibility under the law, that the development of even the Smith Mountain project could be undertaken by a private company—although this project contains flood control features—and although there were bills before Congress seeking to provide authorization for Federal construction of this project even as he spoke. Colonel Gee explained that any license issued for Smith Mountain to private interests necessarily would contain provisions carrying out the flood control requirements determined by the Corps of Engineers to be necessary. The discussion of the Roanoke Rapids site, including the statement by Colonel Gee that an ap-

plication for its development was before the Federal Power Commission while he testified, is very illuminating. Neither Colonel Gee nor any of the Committee [R. 5459; *44*] members indicated that he saw any impropriety in the Commission's consideration or the possible granting of the application. It seems certain that this would not have been the case if the members of the Committee of Congress had believed or interpreted the Flood Control Act of 1944 to mean that the Roanoke Rapids project had been authorized or reserved by that Act for development by the United States, as the able opponents of the pending application have earnestly contended.

* * *

[R. 5461; *46*] It has been sought to make much of the fact that the precise development of Roanoke Rapids proposed by the Applicant differs in some respect from the comprehensive plan contained in House Document No. 650, and the contention has been made that the plans as set forth in that House Document have been, in effect, legally "frozen" so that any development by the Applicant herein varying from the plan in the Army report will constitute a disregard for the action of Congress, if not a violation of law. The difference between the project as outlined in House Document No. 650 and the project proposed by the Applicant is not significant, in the view of the Department of the Army. Colonel Gee said "This development of the Roanoke Rapids project is to be exactly in accordance with the project as recommended by the Chief of Engineers in this document" (House Doc. 650). General Pick, Chief of Engineers, speaking to the Committee, said, in answer to a question as to whether or not the Corps of Engineers itself had authority under existing law to change a project once it had been authorized (a stage which the Roanoke Rapids project has not attained):

> "If we were to select a dam, for instance, at a particular point on a stream and investigating that foundation we would find that the foundation there was not as good as it was downstream a little ways or upstream a little ways and that the building of that reservoir at either one of those new locations [R. 5462; 47] would accomplish the same purpose, we do have that authority, that amount of leeway. We do not have authority to move a project from one stream to another. We do not have authority to go very much beyond the area that Congress has authorized us to build a structure, to build a reservoir."[1]

The Department of the Army has reported under Section 4(e) on the application involved herein. It has stated that its studies "indicate that the Power Company's plan proposed in the amended application is satisfactory for development of the water resources of this reach of the Roanoke River", notwithstanding the fact that it varies slightly from the exact plans for the Roanoke Rapids site contained in House Document No. 650. The plans of the Applicant, it is concluded on the whole, represent substantially, the Roanoke Rapids project as described in the House Document 650. Such difference as exists does no violence to the comprehensive plan of the Chief of Engineers as "approved" by the Congress.

It is interesting to note that the Smith Mountain Dam was fourth in the list of projects for step-by-step development in the comprehensive plan as presented by the Army Department District Engineer and embraced in House Document No. 650. Buggs Island was first in his list and Philpott, on a tributary of the Roanoke, was ninth. In 1944, the Chief of Engineers while concurring generally in this basic

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[1]Hearings on the Flood Control Act of 1949 (Title II), cited *supra*, page 33, *fn.* 9.

plan recommended its alteration so that Buggs Island (No. 1) [R. 5463; *48*] and Philpott (No. 9) would be authorized as the initial steps (Nos. 1 and 2). Presumably, if the United States were to follow and carry out the master plan without further change, Roanoke Rapids and Gaston should follow the construction of Buggs Island and Philpott, rather than Smith Mountain, which is farther down the list even in the order of development as modified by the Chief of Engineers and as finally approved in 1944. We have seen that when the Chairman of the House Committee inquired as to the reason for the Army's change in recommendation in 1949 as to order of building, Colonel Gee, for the Chief of Engineers, admitting that his Department had changed its recommendation, ascribed the change to the fact that Smith Mountain is the only remaining flood control dam. But, it seems that the fact that the Applicant here had applied to the Commission for authorization to build the Roanoke Rapids project and the further fact that it was expected that a non-Federal or private party would file an application seeking license to build the Gaston project, may have played some part in the change, Colonel Gee pointing out that the remaining eight projects are straight power projects.[1] The propriety of this change of recommendation, discussed in the same breath, as it were, with this application, was not questioned by the members of the Committee. The fact that if Smith Mountain should be authorized by Congress thereafter, such authorization would further rearrange the step-by-step [R. 5464; *49*] order of the development originally set forth in the Congressionally-approved Army plan, did not appear to disturb anyone.

Careful consideration has been given to the view that the Commission has already performed its function under Sec-

[1]Hearings on the Flood Control Act of 1942 (Title II) *supra*, p. 38.

tion 7(b) of the Act and to the facts and circumstances in which the Commission's letter of May 3, 1944 was written as well as to its contents. * * *

* * *

[R. 5465; *50*] It must be and is concluded that Congress has not reserved or authorized the Roanoke Rapids project for development by the United States, that the Commission has not yet performed its function under Section 7(b), and that it still has jurisdiction to entertain the pending application and to issue a license for the said project provided the requisite findings of fact upon the merits can be made upon the record.

[R. 5466; *51*]

Should the Roanoke Rapids Project Be Constructed by the United States itself?

Jurisdiction having been found, the next issue to be determined in this proceeding is whether or not upon the record in this proceeding, it should be found that the development of the water resources at the Roanoke Rapids site should be undertaken by the United States itself. Under Section 7(b) of the Act, this is a question which must be determined by the Commission upon consideration of any application seeking license to develop any water resources under the terms of the Federal Power Act.

It has already been concluded that the Commission has not heretofore performed its functions of deciding that question.

* * *

[R. 5467; *52*] * * * Investors may be consumers and consumers are often investors. The public interest embraces both classes and depends not alone upon the comparative direct benefits to one group of citizens or another but also

[R. 5468; 53] upon other effects important to our economy, our government and to the whole population.[1]

* * *

[R. 5470; 55] While Roanoke Rapids was number three on the list of projects for step-by-step development of the basin, as set forth in the House Document No. 650, the Corps of Engineers which prepared that recommendation has now recommended that the project originally set forth as number four—Smith Mountain—take precedence over the others preceding it in the original list. Thus it appears that the order of precedence is far from fixed, so far as the Corps is concerned, and Roanoke Rapids, as a purely hydro-

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[1]The need for balance between diverse elements in our economic picture was forcefully set forth by the President in his Address to Congress on January 4, 1950 (House Document No. 389, 81st Cong., 2d Sess.; 96 Cong. Record 62-66) and again in The Economic Report of the President, transmitted to the Congress, on January 6, 1950 (House Doc. No. 388). In the January 4th address, the President said:

> "These gains [increase in average family income, etc.] cannot be achieved unless our businessmen maintain their spirit of initiative and enterprise and operate in a competitive economic system. * * * Businessmen must continue to have the incentives necessary for investment and for the development of new lines of enterprise. * * * As our national production increases * * * the number of independent and competing enterprises should also increase. If the number does not increase, our constantly growing economy will fall under the control of a few dominant economic groups whose powers will be so great that they will be a challenge to democratic institutions."

In the January 6th Report, the President said:

> "This effective teamwork between free enterprise and Government confounded the enemies of freedom who waited eagerly, during 1949, for the collapse of the American economy. * * * If we are to use all these resources [technology, productive facilities and labor] we must tap the dynamic forces of expansion within the American economy. One of the most important of these dynamic forces is the process of business investment, by which productive capacity is enlarged and improved. * * * [Then, noting the decline in business investment in 1949] There is no need for

electric project in the comprehensive plan which has flood control as its primary and paramount objective, is little likely to receive any preference or early authorization. If a non-Federal developer with private capital to be invested is not permitted to proceed at once with the development of Roanoke Rapids, how many years must its development wait? On this point, the statements of the Department of the Army spokesman before the Committee of Congress are pertinent:

> MR. PICKETT. Now, what is generally the idea of the Corps of Engineers as to the orderly course of development of the comprehensive plan, with a view of how

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this decline to continue. There are immense opportunities for business investment in nearly every segment of the economy. There are in general sufficient funds available to businessmen who want to seize these opportunities. The initiative of businessmen, aided by proper Government policies, can and should soon reverse the trend of business investment. * * * If we are to continue our economic growth the major economic groups must all pull together—businessmen, wage earners, and farmers must work toward the same ends. Government, in turn, must carry out the aspirations of the whole people. * * * Businessmen should base their investment policies on confidence in growth * * *.

[R. 5469: 54]

"To promote an environment in which businessmen, labor, and farmers can act most effectively to achieve steady economic growth is a major task of the Government. It must perfect measures for helping to stabilize the economy. It must build up the natural resources which are essential to economic progress, and expand the protective measures against human insecurity. It must keep open the channels of competition, * * * and encourage expanded opportunities for private initiative. * * *

"Under our system, private and public policies go hand in hand. Private economic policies provide motive power to the economy. Public economic policies provide the framework for economic activity. Sound plans for our future growth must take account of both, and blend them to achieve maximum effectiveness. * * *"

The President, in this Report, reiterated his concern with respect to the downward trend of private investment.

many years it will require you to complete it if you had the money to proceed in keeping with the plan that you would like to follow?

COLONEL GEE. If the Smith Mountain project should be authorized in this present session of the Congress, the earliest date for planning money would be next year. The [R. 5471; *56*] earliest possible date for first construction money would be in 1952. It would take approximately four fiscal years to see the completion of that project, bringing it into the latter part of fiscal 1956. That would be the best possible speed you could expect to make on the construction of this project.

MR. PICKETT. You would require, then, something in the neighborhood of 15 to 20 years to complete the comprehensive plan if you just took them up in the course of an orderly procedure; is that right?

COLONEL GEE. The comprehensive plan might never be completed, Mr. Pickett, if the demand did not arise for the power generated by the remaining eight projects in the over-all plan. Their only justification is power. If the demand is not there, it would be a mistake to build them, either with Federal capital or with private capital.[1]

* * *

[R. 5472; *57*] In the Message From the President of the United States—the Budget for 1951 (House Doc. No. 405, 81st Cong. 2nd Session; 96 Cong. Rec. 169-193) released on January 9, 1950, the President said:

* * *

[R. 5473; *58*] "The 1951 Budget provides for total expenditures of 2.2 billion dollars in this area [natural resources] an increase of 373 million dollars from 1950. Over one third of the total and of the increase is attrib-

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[1] From hearings on the Flood Control Act of 1949 (Title II) cited *supra* p. 33, *fn.* 9.

utable to expenditures for atomic energy. The balance represents primarily the requirements of projects under way in the fields of flood control and reclamation. This Budget provides for no new projects in these areas. Despite the large number of highly meritorious projects which have already been authorized for construction, we should not at this time add to the present high level of commitments. * * *

* * *

"* * * the flood control program of the Corps of Engineers, involving the construction of dams, power facilities, canals, channels, and levees, will be limited in 1951 to continuation of work on projects started in prior years. * * *"

* * *

[R. 5474; *59*] * * * we have extreme improbability of development by the United States of Roanoke Rapids within any early [R. 5475; *60*] foreseeable time together with the availability of private capital anxious to proceed at once. We have here also an applicant which necessarily must make provision at once for future load requirements and which has only the alternative of construction of a steam-electric plant with dependence upon coal—a non-replaceable fuel—subject to price advances in a rapidly changing economic picture.

* * *

[R. 5477; *62*] It is not felt that there is any good reason or ground for believing that the interests of the public at large would not be fully protected by the Commission's exercising its jurisdiction and issuing a license under the Federal Power Act. The existence of such ground cannot be assumed without flouting and derogating the judgment of the Congress which enacted the Federal Power Act, legislation designed to promote hydroelectric development under license the terms of which are intended to safeguard the

public interest and the welfare of consumers and investors as well.

[R. 5478; *63*] Whether one agrees in all respects with the policy of a statute or not, no one—especially no public officer—can escape the duty of faithful obedience.

It does not appear that in the circumstances, the water resources at the Roanoke Rapids site should be made the subject of a recommendation to Congress under Section 7(b) for development by the United States and it is concluded that the Commission's jurisdiction to issue a license for this proposed development by the Applicant herein, should, on the record, be exercised. If the Federal Government were poised, ready to commence at once construction of all elements of the Roanoke River plan, the effect upon the benefit-to-cost ratio of the entire plan by the extraction of one of the sites—Roanoke Rapids—would be a matter entitled to much weight. However, the benefit-to-cost ratios for the plan as a whole as well as for the individual elements are constantly changing and shifting. We have seen how the Department of the Army has been willing to revise its recommendations as to the proper order for development, and how its spokesman has estimated that even if the entire construction program were authorized to be carried to completion, such completion might require fifteen to twenty years at best. The hearings before the Committee on Public Works contain a [R. 5479; *64*] statement by a Department of the Army spokesman (Col. Wayne S. Moore), when inquiry was made into benefit-to-cost ratios on the Savannah River Basin projects, to the effect that the Army engineers have made mistakes "in potential estimates about what might be in the future."[1]

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[1]See p. 159, Hearings on the Rivers and Harbors Act of 1949 (H.R. 5472, Title I) before the House Committee on Public Works (81st Cong., 1st Sess.)

It is easy to see that these benefit-to-cost ratios, estimated five years ago, may not be the same at all fifteen to twenty years hence. It is necessary to view this question in the light of the present and the immediate future. Without assurance that the needed additional energy from Roanoke Rapids would within any early foreseeable time be supplied by Federal construction, any benefit-to-cost calculation would be purely speculative in nature.

Consideration of the physical qualities of the Roanoke River, the size of its drainage area, its average rate of discharge, its relative importance with respect to other rivers in the United States, including a consideration of the economic relationship of the basin to the economy of the whole nation, indicates no unique characteristics, from a national standpoint, which should cause this river to be set apart as being a problem of such vital importance as to require Federal development of all of its power resources. The flood problem of the Roanoke is a national problem, of course, but this is well on its way to solution. There has been no indication that the requirements of national defense or national security require the particular attention of the United States in regard to the development of projects on this [R. 5480; 65] river with respect to the hydroelectric features. The priority of the single-purpose Roanoke Rapids hydroelectric power project would seem to be relatively low in comparison with many other projects throughout the nation which have multiple-purpose features, including primary considerations of flood control, irrigation, and navigation. Congress has a backlog of more inviting investments for public funds, including projects which have been authorized definitely, but for which appropriations have not been made. Early authorization by Congress and construction by the United States of the Roanoke Rapids project is not indicated. In the

interest of the public at large, and in the interest of that smaller segment of the public which can be expected to benefit directly from the energy to come soon from Roanoke Rapids if its construction is provided for at once, there is no good reason to delay indefinitely the construction of this project to the end that the work might possibly at some future time be undertaken by the United States.

Adaptability to a Comprehensive Plan under Section 10(a)

* * *

[R. 5482; *67*] The plan for development of Roanoke Rapids, as submitted in the original application, was questioned by the Commission's engineering staff following its initial routine study. Conferences between the engineers of the Applicant and of the staff which ensued resulted in the filing of the amendment to the application. In the view of the Commission's engineering staff, the original plans did not provide the fullest feasible development of the site. The plan as revised as a result of these conferences, in the opinion of the staff, represents a scheme for complete development of the water resources involved. * * *

SUPPLEMENT TO EXAMINER'S DECISION

November 15, 1950

[R. 5632; 5] HAMPTON, *Chief Presiding Examiner:* In the further hearing held in this proceeding in June and July of this year under the Commission's order of April 27, 1950 as amended by its order of June 15, 1950, the Secretary of the Interior[1] was permitted, in his proper turn and without limitation of time, to introduce any additional relevant and material evidence he desired to offer and was not confined to

[1]Sometimes hereinafter referred to as "The Secretary" or "Interior".

newly discovered evidence or evidence which with reasonable diligence could not have been offered in the hearing held last year. Equal opportunity was of course given to all parties, in their proper order, to present further evidence.

Interior's additional evidence, as well as the additional evidence introduced by others including the Applicant, the Virginia Electric and Power Company,[1] was directed principally to the questions of (1) the economic feasibility of the Applicant's proposed development; (2) whether or not, otherwise, the Applicant's proposed project "is best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of water-power development and for other beneficial public uses, including recreational purposes":[2] and (3) whether or not the development of the project at the Roanoke Rapids site "for public purposes should be undertaken by [R. 5633; 6] the United States, itself".[3]

The March 1950 initial decision, of course, undertook to dispose of these issues, and it is necessary now only to consider the legitimate effect, if any, of the additional evidence received at the further hearing, upon (1) the issues and (2) the findings and determinations made in that decision. Because of the extraordinarily liberal bounds within which additional evidence was received at the further hearing, it has been necessary, of course, to re-examine also almost all the evidence received at the 1949 hearing as well as the findings and conclusions thereupon, heretofore reached and stated.

Although the question was re-argued by counsel for Interior in his brief, no additional evidence was introduced

[1]Sometimes hereinafter referred to as "VEPCO" or "Applicant".

[2]Federal Power Act, Sec. 10(a).

[3]Federal Power Act, Sec. 7(b).

upon the primary jurisdictional question of whether the Congress has reserved the Roanoke Rapids site for development by the United States and thus whether or not the Commission has jurisdiction to entertain the pending application of Virginia Electric and Power Company. Nor was any additional evidence presented on the question of the Commission's jurisdiction to determine, now, the question posed by Section 7(b) of the Federal Power Act, and (in the event it should be determined that the evidence does not show that the Applicant's proposed development is one that should be undertaken by the United States, itself), then to consider and act upon the merits of the application under the further tests prescribed by the statute. The matters touching [R. 5634; 7] jurisdiction cited and argued by Interior's counsel in the brief recently filed were considered, so far as they were material, in connection with the initial decision of March 1950. These matters have now been examined again, but no good reason or ground is perceived for changing the findings or decision upon the jurisdictional questions. It may be added here that Section 10(f) of the Federal Power Act obviously contemplates the licensing of power projects downstream from storage reservoirs or headwater improvements constructed by the United States, as do also Sections 4(e) and 3(8) when considered together. Section 4(e) clothes the Commission with authority to issue licenses for projects in streams "or other bodies of water" over which

[1] Section 10(f), in part, provides: "That whenever any licensee hereunder is directly benefited by the construction work of another licensee, a permittee, or of *the United States* of a storage reservoir or other headwater improvement, the Commission *shall require as a condition of the license* that the licensee so benefited shall re-imburse the owner of such reservoir or other improvements for such part of the annual charges for interest, maintenance, and depreciation thereon as the Commission [Federal Power Commission] may deem equitable". (Emphasis and matter in brackets supplied.)

the Congress has jurisdiction under its authority to regulate interstate and foreign commerce. These of course embrace navigable waters of the United States. Section 3(8) defines "Navigable Waters" and states what they include. Among them are "such other parts of streams as shall have been authorized by Congress for improvement by the United States or shall have been recommended to Congress for such improvement after investigation under its authority".

[R. 5635; 8] Little, if anything, in the way of basic facts, was added to the record by the hearing held this year. Relatively few, if any, material, basic facts are in dispute in the case. There is no controversy with reference to such facts as the Applicant's past loads and requirements, the characteristics of the Roanoke River and its recorded flows, the recommendations of the Army Engineers with respect to the development of the basin, the status of existing navigation and the character and amount of past navigation in the various reaches of the river, etc., etc. The matters in dispute are, in the main, in respect of the conclusions to be reached upon the basic facts plus the evidence given by expert witnesses and the proper application of the law to such conclusions. Much of the evidence given by the engineers necessarily consists of judgment, opinions, estimates and forecasts for the future, containing inevitably, elements of uncertainty, although supported by informed judgment based upon study, experience and a knowledge of the pertinent facts of the present and past. The best that can be done with conflicting evidence of this character, is to accept the views which are judged to be the most reasonable and best supported by the facts in evidence as well as the intent and purpose of the Congress in the formulation and enactment of the statutes under which the proceeding has been heard and must be decided. Appropriate consideration must of course be given to the fact (where, as here, it is a fact) that

plural groups of engineers, each of them making its own independent investigation and study, reach substantially similar conclusions while another group stands alone in reaching different conclusions. [R. 5636; *9*] Under the law, it is the judgment of the administrative body, guided and ripened by its sense of public duty and its special knowledge, study, experience and resultant expertise, which must, in the light of the evidence and the intent of the law-making body, consider and reach conclusions from such evidence and decide the issues to which it is addressed.

Counsel for the Secretary contended again in the reopened hearing that the natural flows of the Roanoke River would not be of sufficient magnitude and duration to produce the 91,000 kw of dependable capacity assigned to the proposed Roanoke Rapids plant by the Applicant, and that the Applicant has underestimated the extent of the headwater benefits which will be conferred upon the proposed new plant. It was contended further that payments for such headwater benefits arising from improvement of the flow of the river by the upstream Army project, will necessarily be in an amount which will render the proposed project economically infeasible. These contentions are based upon a conclusion as to the character of the benefit to be conferred, and because that conclusion, as will be shown, is based upon an engineering assumption which is quite wrong, Interior's studies which have been prepared upon such assumption must fail of their purpose. The evidence introduced by the Applicant and the Staff, it is thought, well establishes that the Applicant's proposed project (1) would be fully dependable to 91,000 kw capacity on the anticipated VEPCO load if required to operate under the most adverse conditions ever to be expected, based upon the water supply records of past years, and (2) would be economically [R. 5637; *10*] feasible. The hydraulic study which supports these conclusions was appar-

entry undertaken with recognition that "natural flow" of the Roanoke is a thing of the past, since the Buggs Island reservoir project will regulate the major part of the flow. This study shows that Applicant's proposed project will be fully dependable upon the flows as regulated and improved by the Buggs Island reservoir project, so long as these regulated flows, on a weekly basis (during the period of highest peak demand on the Applicant's system) are not less in amount than the quantity of water which would have been available for use by the Roanoke Rapids project had there been no construction of a dam and storage reservoir at Buggs Island by the Government.

* * *

[R. 5650; *23*] The completed application for license to construct the power plant and dam at Roanoke Rapids was filed April 6, 1949. The contest here has been greatly protracted. In the present grave emergency, the Government looks to private industry for cooperation and support and, where practicable, for increased investment of private capital for the immediate strengthening of the national economy and security. In this case, an experienced and successful private utility company is ready, willing and able to proceed under Federal license and regulation with the development and utilization of idle and wasting natural resources at Roanoke Rapids without aid of the Federal Treasury and substantially in harmony with the Army's comprehensive plan. Its proposed project [R. 5651; *24*] has been approved by the Army Engineers.

An additional supply of much needed electric power produced by a private utility under governmental license and regulation (designed by the Congress to protect and promote the public interest) would have much the same relationship and value to national security that an additional supply of

government-produced power would have.[1] In view [R. 5652; 25] of the willingness and desire of the Applicant to utilize immediately the now largely idle and wasting waters of the

[1]In this connection, the speech of the able Secretary of the Interior in welcoming on October 19, 1950 the 30 members of his Electric Utilities Defense Advisory Council (two-thirds of whose membership consists of officers of private electric utility companies) and making a strong and patriotic request for cooperation between all segments of the industry in expanding and enlarging generating capacity and in preventing power-supply bottlenecks from impeding industrial expansion, seems particularly pertinent and timely. The Secretary, according to a press release issued by the Interior Department, among other things, said:

"I am happy to welcome you to the first meeting of the Electric Utilities Defense Advisory Council. Those of us in this room today have a tough job ahead of us. Our job is to make sure that enough electric power is available when and where it is needed to meet the expanding requirements of the National Defense Program and at the same time to take care of the requirements of all segments of the civilian economy. Expansion is the keynote of the Rearmament Program we are now undertaking. The Defense Production Act passed by Congress last month contains an entire section dealing with expansion of productive capacity and supply. And President Truman has made it clear that long-range defense plans will call for enlarging our capacity to produce all along the line. In the field of electric power, therefore, our job is to build up the country's power plant as rapidly as we can, and to increase efficiency by every means that ingenuity can devise, in order that enough power will be available to keep our entire economy, civilian and military, running in high gear, despite sharply increasing demands for electric energy. Since the Korean conflict began the private electric utility companies have announced plans for very large additions to generating capacity. Those companies are to be commended for their prompt recognition of the seriousness of the situation. In my opinion, however, presently planned expansion will be insufficient to meet prospective demands, as we now see them, and I hope that the members of this Council will today consider ways and means by which further expansion in capacity can be accomplished. To do the tremendous job ahead, to prevent power-supply bottlenecks from impeding industrial expansion calls for unremitting effort, resourcefulness, and ingenuity on the part of every member of the Electric Utility Industry. In addition, it calls for unselfish and willing cooperation between all segments of the industry. That is why I have asked you to meet here. I ask you to give us your cooperation, your advice and your assistance in doing the difficult job ahead. I am sure that all the public and private power that can be developed will be needed in the current situation."

Roanoke at Roanoke Rapids to produce needed additional power and the existing necessity for the exercise of special care in the long-term investment of public funds, as well as upon consideration of the other facts of record, the prospect of the government, itself, through new legislative authorization and appropriation, undertaking construction of a purely hydro-electric project at the Roanoke Rapids site, appears to be even more remote and improbable now than when the decision of March 1950 was issued. Further delay in the construction of the Roanoke Rapids project would prolong unnecessarily the wastage of the water of the Roanoke River. Such continued wastage could not, it is thought, be justified now in the face of the pending application, the established need for additional power in the area and the general need for increased effort and speed in the development of idle water resources in the interest of the country's economy and safety.

Exhibit No. 1

HOUSE DOCUMENT No. 650

78th Congress, 2d Session

[R. 3539; *ix*]

LETTER OF TRANSMITTAL

WAR DEPARTMENT,
Washington, May 30, 1944.

THE SPEAKER OF THE HOUSE OF REPRESENTATIVES.

DEAR MR. SPEAKER: I am transmitting herewith a report dated May 22, 1944, from the Chief of Engineers, United States Army, together with accompanying papers and illustrations, on a review of reports on and survey of the Roanoke River, Va. and N. C., and Smith River and its tributaries, Virginia and North Carolina. This investigation was requested by resolutions of the Committee on Flood Control, House of Representatives, adopted on August 28, 1940; the Committee on Rivers and Harbors, House of Representatives, adopted on January 26, 1942; and authorized by the Flood Control Acts approved on June 22, 1936, and June 28, 1938.

Since there will be very large quantities of manpower, materials, and equipment involved in even the first step of the recommended improvement and since the improvements are not essential to the war effort, the Department is of the opinion that, if the improvements are authorized, initiation of construction thereon should be deferred until after the war.

The Bureau of the Budget has been consulted and copies of its letter of comment are enclosed.

Respectfully,

HENRY L. STIMSON,
Secretary of War.

* * *

[R. 3550; *10*]

REVIEW REPORT ON ROANOKE RIVER, VA. AND N. C.

* * * *

[R. 3552; *12*]

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
Norfolk, Va., January 30, 1943.

Subject: Review Report on Roanoke River, Va. and N. C.

To: The Chief of Engineers, United States Army, War Department, Washington, D. C. (Through the Division Engineer, Middle Atlantic Division).

1. *Authority.*—This report on the Roanoke River, Va. and N. C., is submitted in accordance with the following act and resolutions of Congress:

(*a*) Public Act No. 738, Seventy-fourth Congress:
"Be it enacted by the Senate and House of Representatives of the United States in Congress assembled, * * *

"SEC. 7. The Secretary of War is hereby authorized and directed to continue surveys, studies, and reports at the following-named localities, where, according to surveys and estimates already made, opportunities appear to exist for useful flood-control operations with economical development of hydroelectric power whenever sufficient markets to absorb such power become available, * * * Reservoirs on Roanoke and Tar Rivers, North Carolina. * * *"

(*b*) Public Act No. 761, Seventy-fifth Congress:
"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, * * *.

"SEC. 6. The Secretary of War is hereby authorized and directed to cause preliminary examinations and

surveys for flood control, including floods aggravated by or due to tidal effect at the following-named localities, * * * Smith River and its tributaries, Virginia and North Carolina. * * *"

(*c*) Resolution adopted August 28, 1940, by the Committee on Flood Control of the House of Representatives, which requested—"That the Board of Engineers for Rivers and Harbors, * * * is hereby requested to review the report on the Roanoke River, Virginia and North Carolina, as contained in House Document Numbered 65, Seventy-fourth Congress, first session, with a view to determining whether any improvements in the interests of flood control and allied purposes are advisable at this time."

(*d*) Resolution adopted January 26, 1942, by the Committee on Rivers and Harbors of the House of Representatives, which requested—"* * * That the Board of Engineers for Rivers and Harbors * * *, be and is hereby requested to review the reports on the Roanoke River, Virginia and North Carolina, as contained in House Document Numbered 65, Seventy-fourth Congress, first session, with a view to determining whether any improvements are advisable at this time."

* * *

[R. 3553; *13*] 4. *Report under review.*—The report under review on the Roanoke River, Va. and N. C., is printed in House Document No. 65, Seventy-fourth Congress, first session, and was authorized under the provisions of House Document No. 308, Sixty-ninth Congress, first session. That report, covering navigation, flood control, power development, and irrigation, concluded that while affording a potential source of hydroelectric power, a comprehensive plan for the improvement of the Roanoke River and its tributaries for navigation, and the prosecution of such improvement in connection with the development of potential power, flood control, or irrigation, was not economically justifiable at that time (1934). * * *

* * *

[R. 3596; 56]

B. COMPREHENSIVE PLAN OF RESERVOIR DEVELOPMENT

139. The Roanoke River Basin has a large amount of undeveloped water power. Reservoirs may be built to regulate the wide fluctuation of stream flow. The availability of several excellent dam sites, the absence of railroads along the rivers in most cases, and the sparsely inhabited nature of the areas to be inundated by proposed reservoirs, make this watershed attractive for the economical development of its potential water resources.

140. *Report under review.*—The report under review, House Document No. 65, Seventy-fourth Congress, first session, indicated at that time (1934) that 17 outstanding reservoir sites on the Roanoke and Dan Rivers were worthy of consideration for the production of hydroelectric energy. These projects, with a combined installed capacity of about 270,000 kilowatts, would generate about 1.3 billion kilowatt-hours annually, of which 0.8 billion kilowatt-hours were considered as dependable prime power. This system of reservoirs is hereinafter referred to as the "1934 plan."

141. Since 1934 the demand for electrical energy in the vicinity of the Roanoke River Basin has greatly increased, especially in the manufacture of munitions for the war effort. Consideration of the development of the potential water power in this watershed now assumes added importance.

142. *1934 plan.*—The 1934 plan included the reservoirs listed below. It was determined at that time that this combination of reservoirs could have been developed for the maximum utilization of the potential water power of the basin.

* * *

[R. 3597; 57] 144. *Federal Power Commission licenses.*—The Federal Power Commission reports that although

there have been several applications for preliminary permits and licenses filed for projects in the Roanoke River Basin, there are none pending at the present time (November 1941). The following is a record of such applications for hydroelectric developments on the Roanoke River:

* * *

[R. 3598; *58*] It will thus be noted that the large electric utility companies in this region have shown definite interest in the development of the potential water-power resources of the basin. The construction of hydroelectric projects at the better sites in the basin was undoubtedly delayed by private interests because of the depression of 1929-36.

* * *

[R. 3600; *60*] 155. *Project data, preferred and alternative plans.*—Tables 34 and 35, which follow, present general engineering data for the preferred and alternative plans of development. Detailed descriptions of the dam sites, reservoir areas, and summaries of cost estimates for various heights of reservoirs at each site are given in section A of the appendix.[1] [See Petitioner's Appendix, pp. 154-7 for Table 34.]

* * *

[R. 3607; *67*] 156. *Economic comparison of preferred and alternative developments.*—Comparative economic analyses of the preferred combination of reservoirs and the alternative plan are presented in tables 36 and 37, which follow. [See Petitioner's Appendix, pp. 158-9 for Table 36.]

* * *

[R. 3618; *78*] 176. Prior to the construction of the lock and dam at mile 114, the operation of the proposed upstream reservoirs for power production would not interfere with navigation below Palmyra.

---

[1]Not printed.

177. *Potential navigation benefits.*—Navigation is now maintained in the lower 79 miles of the Roanoke River to Palmyra. * * *

178. The potential river traffic above Palmyra is not great. * * *

* * *

[R. 3619; *79*] 180. The factors which would probably tend to make the Roanoke River unattractive for navigation above Palmyra would be (1) lack of potential water traffic and the possibility of transporting such freight more economically on adjacent streams or by trucking on existing highways, and (2) the sinuosity of the stream above Palmyra. Because of these factors, no benefits from navigation have been assigned to the ultimate development in determining the economic justification thereof.

181. However, should the extension of the present navigation project from Palmyra to Weldon be warranted in the future, the navigation benefits as reported in the district engineer's report of May 3, 1938 (published in H. Doc. No. 694, 75th Cong., 3d sess.), may be sufficient to justify the cost of the required navigation lock and dam at mile 114.

* * *

[R. 3625; *85*]

V. Discussion

* * *

[R. 3626; *86*] 212. *Comprehensive plan.*—An investigation was made to establish a comprehensive plan to properly develop the water resources of the basin for the production of hydroelectric power, control of floods, and regulation of low-water flows. Reservoir projects previously investigated and reported in House Document No. 65, Seventy-fourth Congress, first session, were again investigated in light of

present conditions. Most of these, with modifications, were included in the recommended comprehensive development of the Roanoke River Basin. Alternative plans of development were considered.

* * *

[R. 3628; 88]

VI. Conclusions

219. The following conclusions are drawn from the studies and investigations hereinbefore set forth:

(*a*) The flood problem in the Roanoke River watershed is confined mainly to the cities and towns along the Smith River, and to urban and rural areas along the Roanoke River in North Carolina. Infrequent floods also cause damages at urban and rural areas in other sections of the basin.

* * *

(*e*) The Buggs Island Reservoir on the lower Roanoke River and the Philpott Reservoir located in the headwaters of the Smith River are the first two projects in the comprehensive plan which should be developed in the watershed. These two developments are well justified and would include the main flood-control features embodied in the final comprehensive plan of development. They are both adaptable to rapid construction.

[R. 3629; 89] (*f*) Reports of the Federal Power Commission indicate a growing need for additional electrical generating capacity in the important industrial areas contiguous to the Roanoke River watershed. The Buggs Island and Philpott Reservoirs, if built in the near future, would be of definite value in supplying power for the war effort. Only short transmission lines would be required to connect these two projects with the transmission network of the utility companies now serving the industrial areas.

Exhibit No. 10

DEFINITE PROJECT REPORT ON BUGGS ISLAND RESERVOIR

[R. 3668; *1*]

WAR DEPARTMENT
UNITED STATES ENGINEER OFFICE
NORFOLK, VIRGINIA

DEFINITE PROJECT REPORT BUGGS ISLAND DAM AND RESERVOIR ROANOKE RIVER, VIRGINIA AND NORTH CAROLINA

1 February 1946

* * *

[R. 3673; *6*] 20. *Roanoke River reservoir system.* The Flood Control Act of 22 December 1944, approved the general comprehensive plan for flood control and other purposes in the Roanoke River Basin as recommended in the project document. This plan includes 8 reservoirs on the Roanoke River, 1 on the Dan River, and 2 on the Smith River, or a total of 11 reservoirs. The two reservoir projects authorized for construction, namely, Buggs Island and Philpott, are located in relationship to the other approved projects as shown on plate 1.

* * *

[R. 3674; *7*] 23. *Plan of improvement.* The definite project plan for the Buggs Island Reservoir, considered to be the most desirable for carrying out the authorized project, would provide for a multiple-purpose reservoir for flood control, power production, and other functions to be developed as follows:

* * *

Initially installed power capacity . . . . 108,000 kw.

* * *

[R. 3682; *15*] * * * The minimum continuous rate of power generation (primary capacity), based on the 1,085,000 acre-feet of storage and recorded low stream flow, would be 23,000 kw. The net firm power available would be equivalent to 20,700 kw., after deducting 10 percent for the maintenance of continuous flows of 500 to 1000 c.f.s. past the dam in off-peak-load hours. The initial generator capacity of 108,000 kilowatts in four units would be sufficient to maintain a dependable capacity of 90,000 kilowatts to meet the varying peak load demands of the contiguous power market area in a critically dry period (see plate 56). The primary and secondary energy would be 200 and 210 million kilowatt-hours, respectively.

53. Provisions are contemplated in the initial construction for an ultimate increase in the plant capacity to 204,000 kw. by the addition of three units. The ultimate capacity is based on the comprehensive development of the Roanoke River by the construction of additional reservoir projects in conformity with the approved general plan of reservoir development. This ultimate installation also considers utilization of the hydroelectric capacity for peak-load service in regional electric loads which may develop within the period for which planning is appropriate, but beyond the scope of immediate anticipation.

54. *Departure from project document.* The plan proposed in this report conforms to that contained in the project document (H.D. 650) in the general overall dimensions, and differs principally in the allocation of storage capacity and in somewhat more conservative design of several structural details. Within the same height of dam proposed in the project document, greater storage allocation to flood control is planned through the lowering of the maximum power pool level from elevation 312 to elevation 300. This revision

results in a 28 percent reduction in firm energy and a 5 percent decrease in annual energy generation. However, the total power value and thereby the total project value have been increased by the addition of dependable generating capacity and a consequent increase in prospective returns from the sale of power in a market area in which the Federal Power Commission indicates a higher value for power than was [R. 3683; *16*] contemplated by the District Engineer in the project document.

* * *

[R. 3702; *35*] 97. *Summary.* The total estimated cost of the improvements included in the definite project plan is $57,730,000, compared to the estimated cost of $30,900,000 contained in the project document. The principal reasons for the increase in the estimated costs are as follows:

a. The unit costs in the project document were selected to reflect contract prices of January 1942. The unit costs in this definite project report were selected to reflect contract prices of May 1946.

b. The flood-control storage was increased from 416,000 acre-feet to 1,345,000 acre-feet, equivalent to from 1.0 inch to 3.2 inches over the tributary drainage area. To provide for this additional flood-control space, the power pool was lowered 12 feet from elevation 312 to elevation 300, and the top of the spillway gates and the top of the flood-control pool were increased 3 feet from elevation 317 to elevation 320. Raising the top of the flood-control pool resulted in increasing the concrete yardage required in the dam. This increase in the storage reserved for flood control would reduce the damages resulting from the August 1940 flood (reservoir design flood) from $4,886,000 at prevailing price levels to practically nothing, instead of from $3,115,000 to $743,000 as reported in the project document.

c. Ten sluiceways were added in the base of the spillway section, which involves 20 hydraulically-operated gates, 5 feet 8 inches by 10 feet, and the necessary trashracks and bulkhead facilities.

d. The capacity of the initial power plant installation was increased substantially. The Regional Engineer of the Federal Power Commission indicates that the proposed installation can be absorbed in the contiguous power market area by 1955.

[R. 3703; *36*] *e.* The spillway discharge capacity was increased from 525,000 c.f.s to 770,000 c.f.s, which increased the net spillway length from 600 to 924 feet.

f. The power plant was moved further into the abutment to make room for the additional spillway length. This increased the rock excavation in the powerhouse and in the tailrace.

g. Provisions have been made for including a substantial part of the ultimate extension to the initial power plant. These provisions include the rock excavation, penstocks, intakes, temporary bulkhead in penstocks, and part of the substructure integral with the dam for the future units. These provisions will reduce the cost of the future extension to the power plant when ultimately constructed.

h. Additional exploration disclosed less favorable foundation conditions under the main dam and the necessity for lowering the rock line originally assumed for the base of the dam, resulting in greater excavation and increased concrete quantities.

i. Additional exploration also disclosed foundation conditions less favorable than originally assumed for construction of the embankment section of dam.

j. The provision of the two station service hydro units, and the adoption of the intermediate size hydro

unit to facilitate efficient power generation during the minimum releases of from 500 to 2,000 c.f.s. for pollution abatement, fish and wildlife benefits, and downstream power use materially increased the estimated cost.

k. Preliminary negotiations with railway and highway authorities have disclosed that relocation and protection improvements would be considerably more costly than those originally believed sufficient. These higher costs have been included until such time that further negotiations can be carried on. It is believed that in the final settlement the costs might be reduced.

l. As a result of recent developments in methods of clearing reservoirs, it was considered proper to estimate the cost of clearing under three main classifications, each to be accomplished by different methods. The estimated cost of each classification was based on actual recent costs of similar work in comparable reservoirs cleared by the Tennessee Valley Authority, with due allowance for difference in wage scales and accomplishment by contract. The unit costs per acre are also more in line with recommendations made by the Board of Consultants. As a result of the foregoing, and a detailed cruise of timber in the reservoir, the total estimated cost of reservoir clearing was materially increased.

[R. 3704; *37*] *m.* Owing to the flatness of the main tributary valleys in the particular reaches involved, the new backwater curve resulting from raising the maximum flood pool from 317 to 320 materially increases the area to be inundated. Acquisition of this additional area and relocations therein substantially increased the original cost estimate.

98. The evaluated annual average benefits based on May 1946 price level, which would accrue from the proposed operation of the project are $426,000 from the control of

floods, $2,860,000 from the development of hydroelectric power, and $41,000 from land rentals and timber sales, totaling $3,327,000. In addition there will be benefits incidental to pollution abatement, low-water regulation, recreation, value to future downstream hydroelectric plants, value of additional future power generating facilities, and other aspects which have not been evaluated. The annual charges for the project are estimated at $2,863,000. The ratio of annual charges to annual evaluated benefits under the definite project plan, with the initial power plant installation, is 1 to 1.16.

Q. Recommendations

99. It is recommended that the definite project plan, as described in this report, be approved and adopted.

R. E. Cruse
Colonel, CE
District Engineer

[R. 3705; *VI-1*]

Appendix VI

HYDROELECTRIC POWER

* * *

[R. 3707; *VI-3*] *Previous report on project.* Reference is made to the Review Report on the Roanoke River, Va.-N. C., dated 30 January 1943 (House Document 650, 78th Congress). That report describes the general relationship of the authorized Buggs Island project to the balance of the proposed projects in the approved plan for the Comprehensive development of the Roanoke River Basin. The over-all dimensions of the Buggs Island project as contemplated in the definite project plan differ only slightly from those contemplated in the review report. However, compared with the dam and reservoir proposed in the review report, substantial increases have been made in the allocation of storage to be reserved exclusively for flood control, and for provisions of low-flow regulation. This re-allocation of storage has considerably decreased the storage capacity to be devoted to the production of hydroelectric power and has lowered the available head. This revision results in a substantial decrease in the amount of firm electrical energy that can be generated at the site. In compensation, the initial size of the proposed power [R. 3708; *VI-4*] installation has been increased to provide increased dependable capacity. Also, the value of the power at the site, as furnished by the Regional Engineer of the Federal Power Commission, is larger than that contemplated by the District Engineer in the review report. As compared to the review report plan, the project plan for hydroelectric power generation contemplates the

maximum power pool elevation at 300, reduced from the previous recommendation of 312. The average annual generation would be 410,000,000 kilowatt-hours, compared with 431,000,000 kilowatt-hours; the primary capacity would be 20,700 kilowatts, compared with 32,000 kilowatts; and the initial power installation would be sufficient to provide a dependable power capacity of 90,000 kilowatts, compared with 64,000 kilowatts in the review report. * * *

* * *

[R. 3713; *VI-9*] 17. *Power available.* Hydroelectric power available at the project is indicated by the primary capacity, the dependable capacity, and the electrical energy generation. The primary capacity, that capacity which is available continuously under the worst conditions in the period of stream flow records, has been determined to be 23,000 kilowatts (gross). This power rate could be delivered continuously 100 percent of time under any conditions. Some of the water released for nonpower purposes, such as pollution abatement, cannot be used to generate peak load power because it must be released at hours of the day when such power may not be required. After deductions for these purposes have been made, the remaining energy in a minimum flow period is equivalent to a continuous generation of 20,700 kw. This capacity is considered to be the net primary capacity, or firm power, which may be used for peak load service in support of the 90,000 kw. dependable capacity which the installed units of 108,000 kw. of rated capacity are capable of generating at minimum December head. Electrical generation in the minimum year of 200,000,000 kw.-hrs. and in an average year of [R. 3714; *VI-10*] 410,000,000 kw.-hrs. are expected. The installed capacity, the stream flow, and the available storage, are sufficient to sustain the depend-

able capacity in the peak load of Power Supply Area 18 at a capacity factor of 23 percent in the minimum year, and at 49 percent in an average year (20,000,000 kw.-hrs. in any year are not considered usable in the peak). * * *

* * *

[R. 3715; *VI-11*] 20. *Allocation of cost to power.* Allocation of annual charges to the various functions, in proportion to their respective benefits, indicates an average cost of power of 5.9 mills per kilowatt-hour and a maximum cost of 12.2 mills per kilowatt-hour in a minimum flow year. In addition to the cost of power, this allocated charge reflects the cost of the provisions which assure the unevaluated benefits of flood control, pollution abatement, water supply, fish and wildlife conservation, recreation, and other purposes. The average allocated cost of 5.9 mills per kilowatt-hour compares with an average value of 6.9 mills, as indicated by the established unit values of power. It is understood that other methods of allocation of cost to the various functions are possible and may be more desirable.

* * *

Exhibit No. 11

REPORT ON INVESTIGATION OF APPLICATION OF VIRGINIA ELECTRIC AND POWER COMPANY FOR LICENSE

* * *

[R. 3729; 2] 6. *Federal developments.* At the request of Congress, the Corps of Engineers completed a report (published as House Document No. 65, 74th Congress, 1st Session) which indicated that 17 dams could be constructed [R. 3730; 3] in the Roanoke River Basin to develop the water resources of this watershed. A dam at Roanoke Rapids site was included in the plan. No funds were appropriated by Congress to construct any of the potential projects described in that report.

7. At the further request of Congress, the Corps of Engineers in 1944 brought the above report up to date. In this review report (published as House Document No. 650, 78th Congress, 2d Session), the Corps of Engineers recommended a comprehensive plan for the development of the water resources of the Roanoke River Basin, combining the 17 reservoirs of the former plan into 11 reservoirs. This plan is shown on plates 1 and 2.

8. In the Flood Control Act of 1944 (Public Law 534, 78th Congress, 2d Session) Congress approved the comprehensive plan and authorized the construction of two reservoirs, the Buggs Island Reservoir on Roanoke River and the Philpott Reservoir on Smith River.

9. These two reservoirs are now being built by this office. To date $18,100,000 and $2,700,000 respectively have been

appropriated for the construction of these two projects. The Buggs Island Project will be 23 percent complete by 30 June 1949.

B. ROANOKE RAPIDS DEVELOPMENT PLANNED BY THE VIRGINIA ELECTRIC AND POWER COMPANY

10. The Virginia Electric and Power Company has applied for a license to construct a hydroelectric project across the Roanoke River near Roanoke Rapids. A dam in this vicinity was contemplated in the plan approved by Congress.

* * *

[R. 3733; *6*] 19. The extremely detailed investigation made to determine the maximum probable storm for Buggs Island, in connection with the preparation of the plans for constructing this project, is believed to have provided a better indication of the maximum rainfall and maximum spillway discharge to expect than the preliminary studies made in connection with the preparation of House Document 650.

* * *

[R. 3740; *13*]

C. ALTERNATIVE PLANS OF DEVELOPING SITE

37. *Plan as proposed in H.D. 650 (Plan D).* Plates 4 and 7 show the plan proposed in House Document 650 for developing the water resources within the Roanoke Rapids—Weldon area. The plan included a concrete gravity type dam across Roanoke River, 0.57 miles upstream from the proposed VEPCo dam. The maximum power pool would be at elevation 127, five feet lower than the proposed VEPCo project. In order to develop the additional fall in the river between Roanoke Rapids and Weldon, the water would be diverted into a combined flume and canal, designed for a

flow of 15,160 cubic feet per second, which will carry the water to a powerhouse located downstream from Weldon. The combined length of the flume and canal is 8.4 miles, and the length of the tailrace from the powerhouse to the river channel is 1.36 miles. A second powerhouse would be provided at the dam for the generation of electrical energy. The flow of water would be diverted into the existing VEPCo canal for generation of power at the Company's existing plant.

* * *

[R. 3741; *14*] 41. *Plan for tailrace excavation.* (Plan C) Plate 10 shows a plan for developing the head in the Roanoke River from the proposed VEPCo dam downstream to the highway bridge at Roanoke Rapids. This plan would include (a) a dam across Roanoke River at mile 136.95, (b) 8,200 feet of tailrace excavation in the Roanoke River to an average depth of 35 feet and width of 70 feet, and (c) the existing canal and powerhouse. A powerhouse would be located in the Roanoke Rapids Dam. One unit would discharge into the existing canal and powerhouse.

42. This plan permits the development of 70 feet of head. An additional 23 feet of fall between tailwater level (as lowered by the excavation) and Weldon will remain undeveloped. The total installed capacity would be 95,500 kilowatts. The development would generate 332 million kilowatt hours of energy in an average year. During the critically dry period of record, it would generate 157 million kilowatt hours of energy for on-peak use at a load factor of 18.8 percent.

* * *

[R. 3749; *22*] 50. Table 6 indicates that neither Plan B nor Plan D is economically justified for private construc-

tion. Table 5 shows that the portion of Plan 3 (exclusive of the Weldon dam) which develops the same section of river as plan C is also not justified. [the Application before the Amendment] Plan A, which is practically the same as the plan recommended by VEPCo, is economically justified. Plan C [the Application as amended] is as economically feasible as Plan A and develops 15 feet of head in the stream in addition to that developed under Plan A. This leaves only 23 feet of head in the Roanoke Rapids—Weldon reach still undeveloped. [Wording in brackets inserted for reference]

* * *

[R. 3767]

Exhibit No. 19

VIRGINIA ELECTRIC AND POWER COMPANY

Kwhr. Output, Kw. System Maximum Load and System Load Factor

1929 to 1948 Actual — 1949 to 1954 Estimated

Year	Output Millions of Kwhrs.	Annual Increase Per Cent	Annual Maximum Load Thousands of Kw.	Annual Increase Per Cent	Annual System Load Factor
1929	645*	....	N.A.	....	N.A.
1930	691*	7.1	N.A.	....	N.A.
1931	730*	5.6	N.A.	....	N.A.
1932	695*	(4.8)	N.A.	....	N.A.
1933	692*	(0.4)	N.A.	....	N.A.
1934	739	6.8	141	....	59.7
1935	776	5.0	155	9.9	57.2
1936	880	13.4	176	13.5	56.9
1937	958	8.9	182	3.4	60.1
1938	989	3.2	203	11.5	55.6
1939	1129	14.2	239	17.7	53.9
1940	1293	14.5	270	13.0	54.5
1941	1534	18.6	308	14.1	56.9
1942	1728	12.6	326	5.8	60.5
1943	1972	14.1	367	12.6	61.3
1944	2164	9.7	390	6.3	63.2
1945	2200	1.7	425	9.0	59.1
1946	2202#	.1	458	7.8	54.9
1947	2526	14.7	522	14.0	55.2
1948	2806	11.1	576	10.3	55.5
1949	3050	8.7	625	8.5	55.7
1950	3280	7.5	670	7.2	56.0
1951	3480	6.1	710	6.0	56.0
1952	3660	5.2	745	4.9	55.9
1953	3830	4.6	780	4.7	56.1
1954	4000	4.4	815	4.5	56.0

( )—Decrease.
N.A.—Not Available.
*—From House Document No. 650, Page 53, for District No. 18.
#—Normal output curtailed by about 50 million Kwhrs. due to coal

[R. 3768]

Exhibit No. 20

VIRGINIA ELECTRIC AND POWER COMPANY

Kwhr. Output and Maximum Annual Load Increase by Decades

	Kwhr. Output Per Cent Increase	*Maximum Annual Load Per Cent Increase*
1939 over 1929	75.04	N.A.
1940 " 1930	87.12	N.A.
1941 " 1931	110.14	N.A.
1942 " 1932	148.63	N.A.
1943 " 1933	184.97	N.A.
1944 " 1934	192.83	176.60
1945 " 1935	183.51	174.19
1946 " 1936	150.23	160.23
1947 " 1937	163.67	186.81
1948 " 1938	183.72	183.74
*1949 " 1939	170.15	161.51
*1950 " 1940	153.67	148.15
*1951 " 1941	126.86	130.52
*1952 " 1942	111.81	128.53
*1953 " 1943	94.22	112.53
*1954 " 1944	84.84	108.97

N.A.—Not Available.
*—Estimated.

[R. 3774]

Exhibit No. 23

SUMMARY OF DATA CONCERNING ECONOMIC FEASIBILITY OF HYDROELECTRIC PROJECTS ON ROANOKE RIVER

Projects as studied in Stone & Webster Engineering Corporation Report, "Roanoke River Power Sites", dated April 13, 1948

	Recommended Scheme of Development		*Alternative Scheme of Development*			
	Upstream Site A Headwater Elev. 200	*Downstream Site B Headwater Elev. 132*	*Downstream Site A Headwater Elev. 200*	*Downstream Site B Headwater Elev. 127*	*Weldon Canal Scheme Headwater Elev. 127*	*Site B Project as per Amended Application Headwater Elev. 132*
Rated capacity, kw	79,000	67,000	85,000	61,000	57,000	91,000
Average annual output, kwhr	307,000,000	263,000,000	329,000,000	241,000,000	330,000,000	316,000,000
Estimated construction cost of power development	$22,400,000	$18,140,000	$24,020,000	$17,480,000	$25,500,000	$24,515,000
Estimated construction cost of transmission lines and synchronous condenser capacity	520,000	40,000	450,000	40,000	858,000	....
Total construction cost	22,920,000	18,180,000	24,470,000	17,520,000	26,358,000	24,515,000
Interest during construction—4%	916,800	727,200	978,800	700,800	1,054,000	981,000
Total new project investment	23,836,800	18,907,200	25,448,800	18,220,800	27,412,000	25,496,000
Annual cost of power	2,350,300	1,953,800	2,501,700	1,887,300	2,797,100	2,605,800
Annual cost of equivalent steam power, with coal at $8 per ton	2,689,900	2,304,300	2,863,200	2,130,000	2,360,600	2,904,800
Excess of annual cost of steam over hydro	339,600	350,500	361,500	242,700	436,500	299,000
Ratio of cost of steam power to cost of hydro power	1.144	1.179	1.144	1.129	0.844	1.115

Exhibit No. 33
ROANOKE RAPIDS PROJECT
Value of Potential Power
Based on Cost of Power from Alternative Steam-electric Generating Station
(Privately Financed)

Item (1)	Capital Cost ($ per kw) (2)	Fixed Charges (Percent) (3)	Unit Capacity Cost ($ per kw-yr) (4)	Unit Energy Cost (Mills per kwh) (5)
A. Steam-electric Plant	140			
B. Annual Capacity Cost				
1. Fixed Charges				
a. Cost of Money		6.00	8.40	
b. Depreciation (30 yrs.)		1.26	1.76	
c. Insurance		0.10	0.14	
d. Taxes				
e. Local		0.70	0.98	
f. Federal		2.67	3.74	
g. Total		10.73	15.02	
2. Fixed Operating Costs				
a. Fuel—6,000,000 BTU @ 33.5¢			2.01	
b. Operation and Maintenance			3.50	
c. Administrative & Gen'l Expense			0.53	
d. Total			6.04	
3. Total Capacity Cost			21.06	
C. Energy Cost				
1. Variable Operating Costs				
a. Energy fuel—10,800 BTU @ 33.5¢				3.62
b. Operation and Maintenance				0.25
c. Total				3.87
D. Steam Step-up Substation	9			
1. Fixed Charges		10.73	0.96	
2. Fixed Operating and Maintenance			0.18	
3. Administrative & Gen'l Expense			0.03	
4. Total Annual Cost			1.17	
E. Cost of at-site Steam-electric Output at high tension terminals			22.36	3.89
F. Terminal Switching	1.65			
1. Total Annual Cost		10.73	0.18	
G. Value of Roanoke Rapids Output delivered to 110 kv network			22.54	3.79

Exhibit No. 62

ESTIMATE OF TAXES WHICH WILL BE LOST OR SHIFTED TO OTHER TAX PAYERS IF GOVERNMENT BUILDS ROANOKE RAPIDS INSTEAD OF VIRGINIA ELECTRIC AND POWER COMPANY

		Weighted Average Increment Tax Rate of Vepco Security Holders	*16.6%*	*29.9%*	*37.9%*	*49.3%*	*63.4%*	*76.6%*	*82.1%*
1.	Federal Inc. Tax, Vepco	747,000							
2.	Local Property Taxes, Vepco	304,000							
3.	Vepco	1,051,000	1,051,000	1,051,000	1,051,000	1,51,000	1,051,000	1,051,000	1,051,000
	Federal Tax on Vepco Security Holders								
	Income Subject to Tax, Vepco Holders								
4.	Interest	385,000							
5.	Dividends, 90%, 1,219,000	1,097,000							
6.		1,482,000							
7.	Taxable Income, Government Holders	545,000							
8.	Loss of Taxable Income	937,000	156,000	280,000	355,000	462,000	594,000	718,000	769,000
9.	Total Taxes Lost or Shifted		1,207,000	1,331,000	1,406,000	1,513,000	1,645,000	1,769,000	1,820,000
10.	Annual Cost Gov. Financing (Eardley)		938,000	938,000	938,000	938,000	938,000	938,000	938,000
11.	Total (9) plus (10)		2,145,000	2,269,000	2,344,000	2,451,000	2,538,000	2,707,000	2,758,000
12.	Annual Cost Hydro to Vepco		2,863,000	2,863,000	2,863,000	2,863,000	2,863,000	2,863,000	2,863,000
13.	Net Advantage shown by Eardley for Government Hydro Adjusted for certain Taxes Lost or Shifted		718,000	594,000	519,000	412,000	280,000	156,000	105,000
	NOTE: Increment Tax Rate as Shown corresponds to Personal Taxable Incomes of approximately		Not over 2,000	8,000 to 10,000	12,000 to 14,000	20,000 to 22,000	44,000 to 50,000	90,000 to 100,000	Over 200,000

TESTIMONY OF GEORGE R. STRANDBERG

DIRECT EXAMINATION

[R. 77] Q. Mr. Strandberg, will you please state your full name, address, and present occupation?

A George R. Strandberg, 29 Howard Street, Newton, Massachusetts, Chief Hydraulic Engineer, Stone and Webster Engineering Corporation.

* * *

[R. 79] A * * * [R. 80] In late 1947 and early 1948, in connection with a study of power requirements and supply, the power company asked us to include a restudy of the water power possibilities of the Roanoke River below Buggs Island. These studies included up-to-date cost estimates and studies of comparative economics of two alternative schemes of development, as well as the Weldon canal project studied by the Army Engineers in House Document No. 650.

The "Plan and Profile of Roanoke River Power Sites" shows the several projects diagrammatically.

* * *

[R. 81] THE WITNESS: Downstream Site A is the site called Gaston Site in the Army Engineers' report in House Document 650. Upstream Site B with headwater elevation at 127 is the Roanoke Rapids Site in House Document No. 650. The map also shows the diversion canal, penstocks, power house and tailrace canal that are part of the Army Engineers' Roanoke Rapids Project.

As a result of our studies of these alternative developments, we decided that the most economical development of this stretch of river would consist of the two projects shown as upstream Site A and downstream site B. * * *

* * *

[R. 84] Q Mr. Strandberg, will you now state the relative economic merits of the several projects studied and give your reasons for choosing the projects you recommended to the company?

A The Weldon canal scheme was found to be more expensive than steam power, and was, therefore, discarded from further consideration.

The two projects which we recommended, namely, upstream site A and downstream site B with headwater elevation 132 afford a more economical plan of development than downstream Site A and downstream Site B with headwater elevation 127.

The total cost of the two projects recommended was estimated to be about $960,000 less than the alternative projects for the same total installation and same total output.

Also, downstream site B with headwater elevation 132 furnished more adequate pondage than the same project with [R. 85] headwater elevation 127, and thus would be more successful as an individual project constructed in advance of a project at Site A.

In comparison with cost of equivalent steam power, our studies showed that upstream Site A with headwater elevation 200 would have a ratio of benefits to cost of 1.144 and downstream Site B with headwater elevation 132 would have a ratio of 1.179.

Q Right there, is it not true that downstream Site B is the project here covered by this application?

A It is.

Q Will you proceed?

A For the alternative scheme of development, downstream Site A would have a ratio of 1.144, which is the same as for upstream Site A, but downstream Site B with head-

water elevation 127, would have a ratio of 1.129. These ratios assume that the rated capacity of the plant would be dependable on the load and the average annual output would be absorbed. In the case of downstream Site B with headwater elevation 127, the limited pondage would require much more careful load dispatching than for any of the other projects in order to make the installed capacity dependable on the load.

* * *

[R. 87] Q Will you now summarize the principal changes in the original application, which were made by the amendment, and state what was the purpose of each of the changes?

A The principal changes from the original application are the addition of a tailrace channel from the dam site down approximately to the bridge at Roanoke Rapids to increase the head available for the river units by about 18 feet. This causes a widening and deepening of the power station substructure and lowering of the water wheel setting for the resulting lower tailwater level. It increases the capacity and energy output of the plant. While the estimated cost of the revised project increases more proportionately than does the capacity and energy, the overall project is still an economical project and the changes make a more complete development of the power possibilities of this stretch of river.

* * *

[R. 92] A The scheme of development as now proposed develops the maximum head economical for this site without diverting the flow from the stream bed where it is needed to preserve the bass spawning grounds above Weldon and to properly dilute the industrial wastes at Roanoke Rapids. This scheme does not interfere with economical development of the balance of river fall below the Buggs Island development.

[R. 93] Q Does the method of development now proposed in this proceeding by the applicant differ materially from that proposed at substantially the same location by the Chief of Engineers, United States Army, in House Document No. 650?

A The method of development now proposed omits from the development shown in House Document 650 the long canal bypassing Roanoke Rapids and Weldon, which canal would pass through residential developments since built up near Roanoke Rapids and its operation would seriously interfere with flow conditions required for protection of the bass spawning areas above Weldon. A tailrace about 8,000 feet long will largely replace the capacity that would be developed by a canal around Roanoke Rapids and Weldon.

The normal pond-level now proposed would be five feet higher than shown in the Army report. The dam site would be about 3,500 feet downstream from the Army report site.

Q Having in mind that it appears from the Federal Power Act that hydro-electric developments authorized by this Commission under this Act shall be adapted to conserve and utilize in the public interest the water resources of the region, will you now state whether, in your judgment, the development as now [R. 94] proposed by the applicant is adapted to conserve and utilize to the maximum extent practicable the water resources of the region, and, in this connection, will you kindly contrast the development now proposed by the applicant with that described in House Document No. 650?

A In my opinion, the project as now proposed by the applicant makes the maximum economical development of the water resources of this stretch of the river and does not interfere with economy of development of other stretches of the river. The proposal as covered by House Document No.

650 developed a total of 58,800 kw capacity, compared to a total installation of 91,000 kw. in the present amended application. The plan covered in House Document No. 650 has become uneconomical by reason of increased construction in the regions covered by part of the diversion canal. It also would seriously affect the bass spawning area above Weldon.

Q In your judgment, is the plan of development as now proposed in the application, as amended, in this proceeding, the one best adapted to a comprehensive plan for improving or developing the Roanoke River, throughout the reach of the river from Buggs Island to tidewater near Weldon, North Carolina, for the use or benefit of interstate or foreign commerce, for the improvement and utilization of water power development, and for other beneficial public uses, including recreational purposes, as more particularly set forth in House [R. 95] Document No. 650?

A It is.

Q Are you familiar with the report of the Corps of Engineers, U. S. Army, Office of the District Engineer, Norfolk, Virginia, entitled, "Roanoke River Basin, Va.-N.C. —Roanoke Rapids Development (F.P.C. Project No. 2009)—Report on Investigation of Application of Virginia Electric and Power Company for License," dated February 18, 1949, and with the letter of April 27, 1949, from the Chief of Engineers to the Federal Power Commission?

A Yes, I am.

Q Those are the documents, I believe, which have been listed as Exhibits No. 8 and No. 11 in this proceeding?

A Yes.

Q What, in your judgment, are the more significant features of this report, that is, the report of the Army Engi-

neers, and this letter with respect to the application for a license, as amended in this proceeding?

A This report shows that under present conditions the plan included with House Document 650 is not feasible and would be uneconomic. It finds that the plan included in applicant's amended application now on file is economically justifiable. The letter of April 27, 1949, with the suggestion of certain license conditions states that the proposed project is a satisfactory development.

* * *

[R. 262] CROSS EXAMINATION

BY MR. WHITEHEAD:

Q Mr. Strandberg, you testified that your company took part in the preparation of the application now before the Commission and prepared the amendment to that application. Will you please tell us, in dollars and cents, how much the amendment to the application increased the cost of construction?

A The amendment increased the total cost from $18,475,000 to $24,515,000, or an increase of $6,040,000.

* * *

[R. 266] Q Do you contend that the Buggs Island Project will not confer benefits on this plant?

A No, sir, I do not contend that. I think undoubtedly it will increase the amount of energy that can be obtained from this plant. How much, I do not know any way of computing.

Q Do you think that that will be a material benefit accruing from the Buggs Island plant?

A There will be a benefit in kilowatt hours, and just how much those kilowatt hours are worth to the Virginia

Electric Company is dependent on just how they come down and what the load of the Virginia Electric Company is. They will probably only replace steam energy cost during certain periods of the year.

Q What storage capacity does the Roanoke Rapids site have in comparison with the Buggs Island Reservoir?

A. A negligible amount, so far as capacity of storage is concerned.

Q Then during periods of low flow where is the Virginia [R. 267] Electric and Power Company going to obtain the water to run this plant unless they get the benefit of the stored water from Buggs Island?

A The amount of energy in the top peak of the Virginia Electric Company's load for the full capacity value of this plant is less than will be obtained without any upstream storage. The upstream storage would simply mean that the plant could be operated further down on the load curve.

* * *

[R. 275] Q You testified that you are acquainted with the report of the Corps of Engineers dated February 18, 1949, filed as Exhibit 11.

A Yes, sir.

Q And that upon reviewing that report you concluded that according to that report the Roanoke Rapids development, as planned in House Document 650, was not feasible.

A Yes, sir.

Q Can you tell us, sir, why it was that the site which had the highest ratio of benefits to cost in 1944, as set forth in House Document 650, should, by 1949, be rendered non-feasible?

A I believe two things have entered into the picture since

1944. One is that costs have materially increased and the costs affecting the two projects do not necessarily go up in the same ratio.

The second thing is that considerable development has been made along the canal included in the project under House Document 650, which very materially changes the picture from a cost point [R. 276] of view.

Third, the requirements for protection of fish life on the Roanoke River just above Weldon appear to so restrict the operation of a plant, as included in House Document 650, as to probably make it much less efficient than was included in that study.

Q Then, am I correct in gathering that the plan of the Virginia Electric and Power Company for the development of Roanoke Rapids is essentially different from the plan set forth in House Document 650?

A It omits the Long Canal around Roanoke Rapids and Weldon which would take the water out of the bed of the stream, and it includes a tailrace approximately 8,000 feet long in the bed of the river which develops, or makes possible the development of more capacity than could have been developed on any load that I know of, from the water bypassed around the city.

Q As an expert in this field, sir, would you say that the plan, as amended and proposed by Virginia Electric and Power Company, is essentially different from the plan proposed in House Document 650?

A In the points that I have mentioned, it is different. Other than that, it develops a larger flow and almost the same head, for this stretch of the river. It does not develop a small amount of head adjacent to Weldon which is apparently [R. 277] included in the House Document 650 plan.

Q Well, in the first place, is not the site proposed by Virginia Electric and Power Company considerably downstream from the site proposed in House Document 650?

A The dam site is about 3600 feet downstream. I would not consider that a material change in any development. If you find that by moving the dam a reasonable distance that you get a more economical development, you always do so even after a license is granted.

* * *

[R. 295] By Mr. Hankin:

Q Mr. Strandberg, with reference to each of the four projects mentioned—you understand what I mean by the four projects?

* * *

[R. 296] Q What is, in each case, the total energy?

A The total energy from each combination is the same from the sum of the two projects and the total capacity.

* * *

The Witness: For upstream Site A the energy is 307 million; for downstream Site B, with headwater at 132, the energy is 263 million, or a sum of 570 million. For downstream Site A the energy is 329 million, and for downstream Site B, with headwater at 127, it is 241 million, or a total of 570 million.

* * *

[R. 302] The Witness: My estimates show that the combination as now proposed is more economical and I would say, therefore, more feasible as a combined proposition.

* * *

[R. 334] Mr. Moore: If you assume that the tailrace is built in connection with upper Site A and that lower Site B

is developed at elevation 132, would there be any loss of this ten-foot difference that reference has been made to?

THE WITNESS: The total head would be included in the two developments.

MR. MOORE: And the ratios would be the same with respect [R. 335] to upper Site A and lower Site A?

THE WITNESS: That is correct.

* * *

[R. 336] THE WITNESS: In the table just presented, the annual output is shown as 316 million kilowatt hours, which was based on Buggs Island being constructed. In the application, the estimate excluding the effect of Buggs Island is 275 million, or a difference in kilowatt hours of 41 million, which energy would all be on the Virginia Electric Company system, off peak, or dump energy, as there is sufficient energy even in the lowest flow years to make the 91,000 kw prime on the Virginia Electric Company's system.

* * *

DIRECT EXAMINATION

* * *

[R. 1656] BY MR. MOORE:

Q Mr. Strandberg, I call your attention to the testimony of Mr. Hamilton, starting on page 975 of the transcript, particularly on page 981. Have you any comments regarding the statements made in his testimony with respect to the effect of moving the Gaston project site upstream a distance of about 9400 feet to which he referred?

A I have.

Q Will you now give us your comments?

A Mr. Hamilton, in discussing the effect on the Gaston project, if the dam were moved upstream a distance of some

9400 feet, stated that there is another factor besides the cost of [R. 1657] the tailrace excavation which ties into the fact that the installation proposed by the United States for this Gaston project was 54,000 kw. He then develops an additional cost to cover added generator capacity in order to pass a flow of 18,035 second feet, for use at the Roanoke Rapids plant. Two plants in series, such as the Gaston and Roanoke Rapids projects, do not necessarily operate on the same load factor and a peak requirement at Roanoke Rapids plant is no measure of the peak requirements at Gaston plant, unless there were no pondage available at the Roanoke Rapids plant.

The testimony introduced by the power company in this case has shown that there is sufficient pondage at Roanoke Rapids as proposed by the applicant to care for the change to make the Roanoke Rapids plant prime capacity on the Vepco system load, even if the water releases from Buggs Island or Gaston are at a uniform rate over a 24-hour period, and since the Roanoke Rapids plant, as proposed, is to be a peak load plant, the installation at Gaston, as affected by the Roanoke Rapids plant, could be limited to a base load capacity materially less than the 54,000 capacity included in House Document 650.

By this I do not wish to infer that in our comparisons of the two alternative schemes for development of Gaston and Roanoke Rapids the upstream Site A would have less than 54,000 kw. capacity. In fact, as shown in Exhibit 23, the capacity proposed in the comparison was 79,000 kw. The cost of $3,204,000 indicated in [R. 1658] Mr. Hamilton's testimony therefore has no relation to our comparison, nor to the relative capacities required at the two plants.

* * *

Q Mr. Strandberg, on page 982 of the transcript, in answer to the question, "What do you estimate would be the

economic effect", referring to the effect of the Roanoke Rapids project on Buggs Island, Mr. Hamilton developed differences in cost which show $674,920 and a total saving amounting to $1,063,000. Have you analyzed these indicated savings?

A I have.

Q Will you now give us your comments on that matter?

A Mr. Hamilton has shown that if power from Buggs Island, which in other testimony is shown to be an average of 410 million kilowatt hours, costs 5.10 mills, the addition of the Roanoke Rapids plant in the government project would lower the average cost to 4.16 mills. He then states that this difference should be applied to the total of 718 million kilowatt hours to arrive at a saving. If the combination of the two plants resulted in a lower average cost, its effect would be to lower the rate at which the Buggs Island output could be sold [R. 1659] by increasing the rate at which the Roanoke Rapids power would be sold, an equal total amount. The savings to the government at the Buggs Island plant would only be the difference in sale price times the output of the Buggs Island plant, or .94 mills times the output of 410 million kilowatt hours, which would be $385,400.

The effect on the output from the Roanoke Rapids plant would be to increase the sale price by the same $385,400. This would be the total effect in dollars on the sales price for Buggs Island power.

Mr. Hamilton has added to this an apparent saving of .94 of a mill per kilowatt hour from the power from the Roanoke Rapids plant which must be sold at the average price instead of at its cost.

In Mr. Hamilton's further statement that the total saving would amount to $1,063,000, he has again added to his erroneous figure of $674,920, the difference in sale price from

his estimated cost of Roanoke Rapids power up to the average sale price of 4.16. This difference has no relation to the savings at Buggs Island by the addition of the Roanoke Rapids plant and it is not a saving but a loss to the Roanoke Rapids plant which he has previously put into the saving class instead of the loss class where it belongs, as far as Roanoke Rapids power costs are concerned.

Q On page 983 of the transcript, Mr. Hamilton states [R. 1660] the withdrawal of the Roanoke Rapids plant from the comprehensive would reduce the feasibility of the plan from 1.47 to 1.34 which would reduce the benefits by $1,481,000. Have you any comments regarding this statement?

A I have.

Q Will you now give those figures?

A Mr. Hamilton's figures are all taken from House Document 650, or computed from the costs given in that document. The testimony introduced in this case shows that the cost of Buggs Island project, as well as the cost estimated by the Army for the Roanoke Rapids plant are several times the cost included in House Document 650, and the ratios given there and the comparative benefits have no value unless adjusted to present-day costs.

Q On pages 984 and 985 of the transcript, in answer to the question:

"Do you consider the Roanoke Rapids a desirable hydroelectric project without Buggs Island," where Mr. Hamilton develops flow requirements for the Roanoke Rapids plant, have you any comments on that testimony?

A I have.

Q Will you now state your comments on that?

A Mr. Hamilton discussed, in answer to this question,

an Exhibit No. 51, which shows flow requirements for some hypothetical load based on its use for varying number of hours per day, five days per week. All of these figures refer to a [R. 1661] constant rate block type of load and have no relation to the peak type of load for which the Roanoke Rapids plant is proposed, and any conclusions drawn from such a block type load as to flow requirements are entirely erroneous if applied to the Vepco system load.

His exhibit would indicate that for such a load the total energy requirement would be in the neighborhood of 400 million kilowatt hours per year for a 91,000 kw load, 16 hours per day, five days per week, 52 weeks per year.

By contrast the figures in Exhibit 47, intr duced by Mr. Wigglesworth, indicate that for a peak type load, if limited to the energy above a fixed steam capacity, 12 months of the year as estimated for the years 1953-54, would be just over 5 million kilowatt hours per year.

Q They didn't seem to get together very well on that point, did they?

A No, sir.

Q Do you mean to infer that Mr. Hamilton's energy requirement is in error by the difference between these two energy outputs?

A No, sir, I do not.

Q Will you please explain?

A Neither one of these figures is a fair indication of the amount of energy required to make 91,000 kw capacity dependable on the Vepco load. The figure of about 400 million [R. 1662] kilowatt hours is the energy requirement for such a block type of load, 16 hours per day, five days per week, and is several times higher than the true requirements. The figures shown in Exhibit 47 are the energy require-

ments above a fixed system capacity estimated for the one year 1953-54, on the assumption that the steam capacity is the same all the months of the year, and therefore, are no measure of the requirements from such a capacity on the Virginia Electric and Power Company's system load. The two figures are extreme requirements, neither of which takes into account the true requirements of the system load, but indicate that if hypothetical programs are set up extreme figures in the range of these two figures can be secured.

Q Have you studied the testimony of Mr. Hamilton relative to flow releases from Buggs Island?

A Yes, I have.

Q Have you any comments regarding Mr. Hamilton's statement on page 989 of the transcript in answer to the question, "Would you conclude from that that the Roanoke Rapids project does or does not have engineering feasibility to meet the operation schedule without Buggs Island in operation 16 hours per day," and the answer, "It does not," and the next question, "What, in your opinion, is necessary to make the Roanoke Rapids project feasible," and the answer, "Three requirements are necessary. There must be sufficient upstream storage to increase low flows and retard high flows. The discharge of the upstream [R. 1663] storage allocated to power must be controlled for the benefit of the downstream project, and the overall operating costs of the Roanoke Rapids project must be lower than like capacity and energy could be secured elsewhere"?

A I have.

Q Will you now comment on those questions and answers?

A The answer to these two questions, as well as the conclusions drawn on the following page along the same line,

is based on Mr. Hamilton's assumption that the Roanoke Rapids project must carry a 16-hour per day block load and has no relation to the requirement of Vepco's system for output from the Roanoke Rapids project included in the application, and any conclusions drawn from such a hypothetical type of operation, therefore, has no basis in fact as applied to this project.

The three requirements stated have not been considered in the light of the actual flow requirements on the peak load of the Virginia Electric and Power Company's system, and they assume that the releases from the Buggs Island plant must be regulated to suit the requirements of the Roanoke Rapids project, although there is a stretch of river between the two plants which would cause a large time-lag between discharge of flows and receipt at the lower plant, and they do not take into account the fact that at Roanoke Rapids, as proposed by the application, there is sufficient pondage to re-regulate the flow to Vepco's system requirements regardless of the hour and rate at which the [R. 1664] power flows are used at Buggs Island.

Mr. Hamilton is correct in stating that the reservoir at Roanoke Rapids has pondage, rather than storage, in the ordinary interpretation of these words. But the only requirement to fit the flow at the Roanoke Rapids plant to the peak requirements of Vepco's system is sufficient pondage.

Mr. Hamilton then states that preferred customers to whom Buggs Island power would be sold would have some requirements around-the-clock on Saturdays, Sundays and holidays, and that other customers may also need power on nights and week-ends. The Project No. 2009, included in the application, has been designed in our studies as a peak load plant to utilize the flows in the river, regardless of the type of load fed by the Buggs Island plant and the pond-

age at Roanoke Rapids is sufficient to take week-end releases and store them when needed for use during week days.

However, the plant designed includes the release of some water over week-ends through the power plant for sanitary and fish life conditions down the river. It is probable that the week-end load at the Buggs Island plant will be materially less than the average load upon the plant and that it will inherently fit into the flow requirements of the Roanoke Rapids plant.

Mr. Hamilton also states that a contract between the Virginia Electric and Power Company and the Government for the control of releases from Buggs Island is necessary to the effi- [R. 1665] cient operation of the Roanoke Rapids plant and that if such a contract is not obtained the release of water might be so irregular that Roanoke Rapids plant would receive no benefit from Buggs Island, and in fact the operation of the Buggs Island plant might be such as to endanger any benefits that might be secured from the Buggs Island project.

As stated previously, the pondage at Roanoke Rapids is sufficient for any type of release of flow from Buggs Island as far as the fitting of the output to the Virginia Electric and Power Company's system load is concerned. Should Buggs Island plant be so operated as to show no benefits to Roanoke Rapids, certainly there should be no charge for benefits and it it difficult to conceive how the Roanoke Rapids plant operation can be endangered by any type of operation that the United States Government would set up for operation of one of its projects.

However, Mr. Hamilton's testimony indicates that it is impossible in advance of the determination of the Buggs Island operating schedule to determine downstream benefits which might accrue to the Roanoke Rapids plant.

On page 996, Mr. Hamilton stated that it is improper to hope that Buggs Island will be operated with the same load characteristics over a period of 58 years and in a way most beneficial to Roanoke Rapids.

The margin of flow availability at Roanoke Rapids over that [R. 1666] require for peak load operation on Vepco's system, under any type of operation at Buggs Island, is such that changes in type of load fed by the Buggs Island plant will become less and less influential as the system of Vepco grows.

Q Will you now refer to Exhibit 52, introduced by Mr. Hamilton, and his comments on costs and annual charges and benefits to the Roanoke Rapids plant, due to the construction of the Buggs Island project. Have you any comments regarding the figures given and the conclusions drawn by Mr. Hamilton?

A I have.

Q Will you give those now, please?

A In Mr. Hamilton's testimony, Exhibit 52, he divides the cost of the Buggs Island plant between flood storage, power and power storage on the assumption that all of the costs of the dam and reservoir, exclusive of the additional costs for pure flood storage should be allocated to beneficial flow increase.

In arriving at the cost applicable to flood storage, Mr. Hamilton uses an estimated downstream flood benefit, less operation and maintenance chargeable to flood benefits, and capitalizes this at three per cent interest to arrive at $16,000,000, which is reduced to $14,680,000 by an allowance for interest during construction.

There was no direct relation to actual cost of providing flood storage capacity, as can be seen from the following. [R. 1667] Assume that the downstream flood benefits are

increased by property additions below Roanoke Rapids so that the flood benefits are increased by $1,000,000 per year. Then the flood storage cost would be increased by over $25,000,000 and reservoir cost allocable to power shown in this Exhibit 52 would be reduced by that same amount to about $21,000,000, and the annual reservoir cost to power would be reduced by over $700,000, without any change in the capital cost of the various items in the Buggs Island project.

As far as the Roanoke Rapids plant is concerned and any benefit that might accrue from the use of storage, the costs should not include more than the amount that would be required to provide for such storage in the bottom of the reservoir, on the assumption that the total bottom of the reservoir is used for flow regulation.

The cost of the dam and reservoir are materially greater than this cost in order to raise the level of the reservoir to a point where power can be generated in the Buggs Island plant.

In other words, there is a large volume of dead storage proposed for the Buggs Island reservoir, which is provided solely to make head available on the Buggs Island plant and not for useable storage for flow regulation.

The cost of the dam and reservoir for flow regulation should therefore be reduced by the amount necessary to provide head at the Buggs Island plant before any attempt is made to determine [R. 1668] costs allocated to flow storage costs.

Having so reduced this cost figure, the remaining annual costs of the reservoir operation should be divided between Buggs Island plant and any downstream plants constructed in the proportion which the Federal Power Commission deems equitable.

Should the Buggs Island project be operated so that the downstream project secures no benefit from the storage

releases, as indicated as a possibility by Mr. Hamilton, this should eliminate any charges that might be levied against the Roanoke Rapids plant.

In attempting to determine that it would be uneconomical for Vepco to construct Roanoke Rapids project, Mr. Hamilton has not included any of the benefits to the Vepco system, such as having hydro capacity at Roanoke Rapids available for emergency operation, which can be quickly put on the system when not in operation, nor has he credited the hydro plant with the greater flexibility of the system in the division of load between steam plants and hydro plants to give more economical operation of all the plants.

He has mentioned a number of elements which might be considered in determining the relative effects of constructing such a plant. All of these have been considered by the Power Company and its engineers in determining that the project is feasible and economical, and to the advantage of consumers of power from Vepco's system.

Q Mr. Strandberg, will you refer now to Mr. Hamilton's [R. 1669] testimony on pages 1160 and 1161 of the transcript where he makes the contention that the lack of a contract with the Secretary of the Interior regulating the flow at Buggs Island will, in his opinion, prevent the applicant from deriving a capacity output, upon which the ratio of feasibility as shown on Mr. Cary's Exhibit 15, was computed? Have you any comments on that point?

A I have.

Q Will you now state that, please, for the record?

A The Roanoke Rapids project, as proposed in the application, with reservoir level at elevation 132, has a pondage capacity in the top two feet of about 9600 acre-feet, which is sufficient to store 4800 second feet flowing for 24 hours. This pondage capacity is sufficient to take care of the re-

regulation of flows as received from Buggs Island, on any reasonable basis, and fit the required flow to the peak load of the Vepco system to make the full plant capacity dependable on Vepco's load.

Q You heard Mr. Hamilton's testimony at pages 1223, 1224, and 1225 of the transcript, I believe, where he indicated that it was his experience that it was not economical to build a hydro plant for peak load purposes. Do you know of any plants built to operate at low load factor similar to that proposed for Project No. 2009, for large utility systems?

A I do.

Q Will you mention some of them?

A The Conowingo plant on the Susquehanna River built [R. 1670] to serve the Philadelphia system load was designed and built as a peak load plant, and has operated at a dependable capacity of 252,000 kw on their load with a weekly load factor as low as 5.2 per cent. Its annual load factor, based on a dry year, is estimated at about 40 per cent.

The Osage project of Union Electric Company in Missouri on the Osage River has a dependable machine capacity of 100,000 kw on the Union Electric Company's system load when operating on an annual system load factor of about 23.4 per cent.

The Bonneville plant, on the Columbia River, to which Mr. Hamilton referred, is a run of river base load plant and not comparable to Roanoke Rapids in any manner.

Q Have you heard the testimony of Mr. Wigglesworth regarding the relation of Plan D, Exhibit 11, to the Plan in House Document 650?

A I have.

Q Will you give us your comments regarding the points brought out in his testimony?

A Mr. Wigglesworth, in his testimony, stated that the Plan D in Exhibit 11, did not relate to the plan in House Document 650 and that they were substantially different projects. The testimony in this case shows that the dams in the two plans are identical; that the canal from the dam to the power station site near Weldon are in the same location, and that the power station at Weldon is at the same site. The difference in the two plans, [R. 1671] as shown in the testimony, is as to the size of the canal and the size of the power station.

In Plan D these have been increased. Under the general heading, "Alternative Plans of Developing Site," Exhibit 11, the head of paragraph 37 reads as follows: "Plan as Proposed in H..D. 650 (Plan D)," this statement indicates that the Army Engineers' analysis covers the same general plan in both cases.

Mr. Wigglesworth stated that it was an error to arrive at the conclusion that Plan D analysis showed that the Plan in House Document 650 was uneconomical.

Adjustment of the estimate in Plan D in proportion to the canal capacity and power station capacity for the items in the estimate to cover these, shows that the ratio of cost of steam plant output from House Document 650 plan would be approximately 1 to .90, which would show that the plan in House Document 650 would be uneconomical.

Mr. Wigglesworth also introduced a letter from the Army Engineers as Exhibit 46, which shows the Army Engineers' present estimate of cost for the identical plan and capacity shown in House Document 650, would be $31,120,000, exclusive of interest during construction. Adding interest during construction at 7½ per cent, as used in

Exhibit 11, page 18, would add $2,344,000, bringing the total to $33,464,000. Using the same percentages to determine annual charges as shown on page 18 of Exhibit 11, namely, 5 per cent for return on investment, .48 [R. 1672] per cent for amortization, and 2.98 for taxes and insurance, the average annual charges would be $3,202,000.

Applying the same average annual charges for steam capacity of $23.40 per kw, and energy, 4.05 mills per kwh, as used on page 18 of Exhibit 11, to the capacity and energy shown in House Document 650, 58,800 kw, and 356.7 million kilowatt hours, shows average annual benefits of $2,821,000.

The ratio of annual charges to annual benefits shown by these figures would be 1 to .88.

If this estimated output is changed to 326.7 million kilowatt hours, shown in Exhibit 54, introduced by Mr. Wigglesworth, the benefits are reduced so that the ratio becomes 1 to .84. This comparison shows that the plan in House Document 650 would be uneconomical for private construction and confirms the statement which I made in my direct examination.

Q In other words, as I understand it, by a comparison of Exhibit 54, which was introduced on behalf of the Secretary, which set up a comparison with respect to the Roanoke Rapids project in House Document 650, assuming government financing, when the comparison is made using private financing, the ratio becomes 1 to .84?

A That is correct.

* * *

[R. 2991] Q Mr. Strandberg, have you heard the testimony of Mr. Hamilton regarding his Exhibits 79, 80, 81, and 82?

A I have.

Q Have you studied those exhibits?

A I have.

Q In your opinion, do any of those exhibits give any measure or test of the feasibility of the Roanoke Rapids project, as proposed by the applicant in these proceedings?

A No, they do not.

Q Why do you not consider that any of those exhibits give any measure of such feasibility?

A All these exhibits attempt to fit a limited flow to a fixed load pattern for which a different flow is required. They do not take into consideration the estimated load curves of the Virginia Electric and Power Company and the fact that [R. 2992] to carry the sharp peaks of these load curves, a much smaller amount of energy is required for an equivalent capacity. If such sharp peaks are not carried by the hydro plant, an equivalent amount of steam capacity must be made available to carry this load.

* * *

Q Mr. Strandberg, have you heard the testimony of Mr. [R. 2993] Creim in regard to his Exhibit 87?

A I have.

Q Have you also studied that exhibit?

A I have.

Q In your judgment, does that exhibit give any measure or test of the feasibility of the Roanoke Rapids project as proposed in this application?

A. It does not.

Q Why not?

A While Mr. Creim has made different assumptions than did Mr. Hamilton, he has also attempted to fit stream

flow to a position on a load curve for which the flow does not apply. He assumed a flow of 6850 cfs in the top section of his exhibit, instead of 4310 cfs, as assumed by Mr. Hamilton. For the lower half section, he assumed 4310 cfs, but a minimum release of 500 cfs instead of the 2500 cfs assumed by Mr. Hamilton.

For the stream flows assumed, the operation would be higher up on the system load curve shown in Exhibit 29 and on Exhibit 92, and at such higher position on the load curve, the full plant capacity would be dependable on the system load curve with the flows assumed by Mr. Creim.

* * *

CROSS EXAMINATION

[R. 3304] By Mr. Hankin:

Q Isn't it true that your complaint concerning Exhibits 79, 80, 81 and 87 is that they do not take into consideration the fact that whenever the load curve in Exhibit 74 is shown to be deficient, you may be able to put the operation of this project at the peak of your system load curve where you will get capacity of 91,000 KW for one hour on Thursdays in the month of December?

[R. 3305] A No, sir. In the first place, I don't quite get your statement that my complaint about certain exhibits—I haven't made any complaint about any exhibits, I have simply stated, as I will state now, that if you take a fixed load pattern and assume that if you have less flow than enough to carry that fixed load pattern, that therefore the plant is not dependable on another load curve which has been in this case from the very early part, that it is not a proper comparison, and would not be made by any hydraulic electric engineer who had experience on the design and construction of a hydro system, combined hydro and steam system.

* * *

TESTIMONY OF WILLIAM F. UHL

DIRECT EXAMINATION

[R. 112] Q Mr. Uhl, will you kindly state your full name, address, and present occupation?

A William F. Uhl, 80 Federal Street, Boston, Massachusetts, Consulting Engineer and President of Charles T. Main, Incorporated, Engineers.

* * *

[R. 113] Q Mr. Uhl, while you would of course be modest about such a question, is it not a fact that your firm is one of the principal firms in the world engaged primarily in hydro-electric development?

A I believe so.

* * *

[R. 120] Q Mr. Uhl, did I ask you whether it was your firm that designed for the United States Government the Buggs Island Project?

A Our firm designed the power plant and intake section of the dam only.

* * *

[R. 118] A In my opinion the development proposed in the application as amended is adapted to conserve and utilize to the maximum extent practicable the water resources of the region which are within its scope and it does not adversely affect any of the resources of the region outside of its scope. * * *

* * *

CROSS EXAMINATION

[R. 420] Q And you have taken no steps to determine how much water would be available from Buggs Island, how much would be used in order to meet your operating requirements?

A Why, certainly, we take into consideration any water that might come down the river with Buggs Island or without Buggs Island.

Q Without any regulation just as it comes down, or have you figured on some sort of a plan of water coming down?

A The only plan I have considered at all is the plan proposed by the Army Engineers. I have made no independent study whatever of the Buggs Island control because I have no idea how it will be controlled in the future. We assume the flow will be somewhat better with Buggs Island than without it.

Q Then you designed your plant without knowing how much water would be available?

A No, we know that all the water in the river will be available.

Q From the natural flow or from the regulated flow of [R. 421] Buggs Island?

A However it may be affected by upstream storage.

Q Yes, we know how much will be available from natural flow. If you don't want to answer my question just say that you don't want to answer it.

What I would like to know is how much additional water you would need from Buggs Island in order to enable you to operate this plant on an engineering basis?

A We can operate it without Buggs Island on an engineering basis or with Buggs Island on an engineering basis.

* * *

Testimony of Miles Cary

[R. 124] DIRECT EXAMINATION

By Mr. Moore:

Q Mr. Cary, will you kindly state your full name, address and present occupation?

A Miles Cary, 504 North Meadow Street, Richmond, Virginia, Manager of System Operation of the Virginia Electric and Power Company.

* * *

[R. 130] Q Will you now refer to Item 7 in the application as amended relating to the location of the project. Will you now describe the relation between such a project at the proposed location and the generating and transmission system set forth on Exhibit No. 14 just introduced in evidence and indicate what, if any, advantages there are in construction of the proposed project at this location?

A The project is located only a mile and a half from the Company's existing hydro station and transmission substation at Roanoke Rapids, North Carolina. From this location is served the entire load in the Roanoke Rapids area. Also from this location extend four 110,000 volt transmission lines; one to the Richmond, Petersburg, and Hopewell area to the north where the Chesterfield and 12th Street steam stations are located, one to the Suffolk-Norfolk area to the east where the Reeves Avenue steam station is located, one to the Tarboro-Columbia area to the south where it interconnects with the transmission system of the Carolina Power and Light Company at Battleboro, and one to the vicinity of the Buggs Island site to the west where it interconnects with another part of the transmission system of the Carolina Power and Light Company. A 66,000 volt transmission line also extends from this substation north to

Emporia, Virginia, and thence west to the [R. 131] Chase City-Halifax-Crewe area. It can be readily seen from the system map of the Virginia Electric and Power Company, Exhibit 14, that the location of the project is practically adjacent to an existing substation which is the center of an existing transmission and distribution system serving a substantial part of northeastern North Carolina and southern Virginia.

I have shown on this map the area which could be advantageously served from the project over the existing transmission system. This area is shown enclosed in a red line extending from west of Roanoke Rapids, North Carolina, to west of Lawrenceville, Virginia, to the north of Jarratt, to the east of Boykins, Virginia, Ahoskie, and Columbia, North Carolina, south of Plymouth, Williamston and Battleboro, to the west of Roanoke Rapids. Assuming reasonably good economic conditions during the next few years, I estimate that the load in this area in 1954 will be approximately 65,000 kw.

Network analyzer studies indicate that after the interconnections with the Appalachian Electric Power Company are made, a balanced interchange of power will normally exist with a substantial flow of power from Appalachian to Virginia in the west and from Virginia to Appalachian through Carolina Power and Light Company in the south. This flow of power to Appalachian through Roanoke Rapids together with the load in this area will require either strengthening the transmission [R. 132] system between the Company's steam stations to the north and east and Roanoke Rapids, including a synchronous condenser at Roanoke Rapids, or the establishment of substantial generating capacity in the southern part of the system. It is my opinion and the opinion of all members of our engineering and operating

staff that the vicinity of Roanoke Rapids as the location of such a generating station fulfills the requirements better and more economically than any other location because it would make possible the supply of capacity needed by the system at the center of a load area and at the center of the existing transmission network serving this area, shown enclosed in the red line on the system map.

Q Have you made a study to determine whether the proposed project is economically advantageous for construction by the Company?

A I have.

Q Have you set forth your findings and conclusions in a table which you are prepared to introduce as an Exhibit?

A I have.

Q Is this tabulation which we now hand you the summary of the results to which you refer?

A It is.

Q Do you believe the facts to be correctly stated on this exhibit?

A I do.

[R. 133] MR. MOORE: We ask this exhibit be received in evidence as Exhibit Number 15.

CHIEF PRESIDING EXAMINER: It will be received.

(The document referred to was received in evidence as Exhibit Number 15)

BY MR. MOORE:

Q Will you now proceed to explain the basis upon which economic feasibility is examined by this study?

[R. 134] A This study is based on the comparison of a power supply program using power from the proposed

Roanoke Rapids Project No. 2009 as compared with the program of power supply using steam capacity which it is estimated would be used as an alternate if the Roanoke Rapids Project is not developed in the near future.

Q Will you review the essential features entering into the comparison thus made?

A The tabulation shows the capability of the proposed Roanoke Rapids Project as 91,000 kw as stated in the amended application which it is estimated will be the dependable capability of the project. The project will have the effect of increasing the dependable capability of the small existing hydro station of the Company at Roanoke Rapids from 3,000 kw to 5,000 kw as shown giving a total dependable capability for the two stations of 96,000 kw.

The tabulation bases the economic comparison between hydro and steam on an annual energy output from the project of 345,000,000 kwhrs. This is computed from the estimate of output furnished us by own engineers, Chas. T. Main, Inc. In order to make a complete and accurate analysis, we have divided the estimated annual energy output into that which would be generated during the on-peak period and that which would be generated during the off-peak periods for both stations. These figures are shown in the tabulation for both [R. 135] stations. In the equivalent steam program we have assumed steam capacity which would supply the same amount of dependable capability and the same total amounts of on and off-peak energy.

This tabulation states an investment of $25,085,000 for the power development for the hydro project. This investment includes all of the items set forth in the Amended Application except the step-up substation which is included in the tabulation together with required step-down substation investment. The values for the power development and

the step-up substation include those given in the Amended Application, which are the estimates prepared for the Roanoke Rapids project by the Stone & Webster Engineering Corporation working in conjunction with Chas. T. Main, Inc. The values given in the tabulation also include additions for the Company's local administrative and engineering costs and interest during construction, as contemplated by Sheet 3 of Exhibit N in the Amended Application. The values for the required step-down substation and the transmission line investment included in the tabulation are estimates prepared by the Company's engineers. The hydro program would require two 110,000 volt transmission lines from the project to the Company's existing Roanoke Rapids substation, a distance of approximately 1.6 miles, and an additional circuit installed on an existing steel tower line from Roanoke Rapids to Suffolk together with the [R. 136] necessary switching facilities at the Company's Roanoke Rapids and Suffolk substations.

To determine the installed cost of capacity under the equivalent steam program, we have used the actual cost of the recently completed first unit of the Possum Point Power Station near Quantico, Virginia, with a dependable capability of 74,000 kw and the recently revised estimate of the cost of the addition of one unit, with a dependable capability of 74,000 kw now nearing completion at the Chesterfield Power Station near Richmond. The Chesterfield and Possum Point stations are both designed for ultimate extension to six units, and it is assumed that any new steam station would be of similar design and cost. Using the actual cost of Possum Point and this revised estimate of cost of the Chesterfield extension, we have estimated the cost of two, three and four unit stations, and for this evaluation have used the cost of a three unit station to determine the cost per kilowatt, as that appears to represent a fair average between the high

cost per kilowatt of an initial one unit station and the lower cost per kilowatt of an ultimate six unit station. In determining this cost per kilowatt of steam capacity we have used the actual practical net capability of the station as a whole, which operating experience has proved to be reasonable in carrying the peak load. The cost of steam capacity thus determined is $129.20 per kilowatt or $11,757,000 for the equivalent steam [R. 137] program.

The item of $1,324,000 for step-up and step-down substations under the equivalent steam program includes a 20,000 kva synchronous condenser at the existing Roanoke Rapids substation together with the necessary switching equipment for a transmission line to connect the steam capacity into the Company's transmission system. In the equivalent steam program, we have included approximately 20 miles of 110,000 volt transmission line which it is assumed will be necessary to properly connect this capacity into the Company's transmission system.

The cost estimates for both substations and transmission lines are based on the experience of the Company in recent construction.

This results in a total estimated investment for the equivalent steam program of $13,581,000 as compared with the total for the hydro program of $26,738,000.

The assumed financing of 55% debt securities and 45% equity capital has been used since that appears to represent the actual ratio that has existed in the past and is expected to exist in the future. Permissible net return on investment has been taken at 6%. Interest on debt is estimated at 3% in the light of current experience in utility financing. The next four items cover the determination of Federal Income Tax. Depreciation in the study is based on the 6% compound interest [R. 138] sinking fund method, using an average life for the hydro station of 58 years, for the steam stations

35 years, for substations 30 years, and for transmission lines 30 years for wood poles and cross-arms, and 50 years for all other items.

Property taxes have been estimated on the basis of the actual assessing practices and rates in the actual localities involved.

This results in total annual charges and taxes, based on the investment only of $2,690,000 for the hydro program as compared with $1,402,000 for the steam program.

The next item is our estimate of the operating and maintenance expense which will be incurred in connection with the various substation equipment and transmission lines included in each of the two programs.

The next item in the tabulation, fixed station operating and maintenance expenses other than fuel, is based for the hydro program on the actual expenses of a somewhat similar hydro power station with certain adjustments which appeared advisable in order to reflect a long time average rather than a single year. For the equivalent steam program this estimate of expense is based on a careful analysis of the actual expenses of our own Chesterfield Power Station, which has been in operation since 1944, with the necessary adjustments to reflect the conditions which would exist in a three unit station. The variable station operating and maintenance [R. 139] expenses other than fuel have been determined in the same manner.

Our estimates of general and administrative expenses and payroll taxes have been determined from a careful analysis of the Company's actual expenses for the year 1948 eliminating certain items which in our opinion are not properly included as they are not a function of the Company's plant investment or operating expenses. For this item we have used 12.7% of the total operating and maintenance expenses other than fuel in Virginia and 13.3% in North Carolina,

the principal difference being the difference in unemployment taxes in the two states.

We have included as the next item an estimate of the additional general and administrative expenses and license fee which will be incurred under the hydro program which will not be incurred in the equivalent steam program.

Fuel expense for the alternate steam program is based on a cost of $5.50 per ton of coal f.o.b. mines and having a heat content of 14,000 B.t.u. per pound. To this cost we have added a freight rate of $3.59 and $.25 per ton which is the average cost to the Company for coal handling and shrinkage. Our estimate of fuel consumption is based on our actual experience at the Chesterfield steam station and is based on an on-peak increment of 11,550 B.t.u. per kilowatt-hour and an off-peak increment of 9800 B.t.u. per kilowatt-hour.

By addition the total annual cost is found to be $2,829,000 [R. 140] for the hydro program as compared to $3,233,000 for the steam program, an excess of annual cost of the steam program over the hydro program of $404,000.

This analysis has been based on the assumption that all Buggs Island power would be sold to the Company. If only half is sold to it, the Roanoke Rapids hydro program compares more favorably with the steam alternative because there would be eliminated from the hydro program the second circuit from Roanoke Rapids to Suffolk and accompanying substation facilities. There is no further change in the comparison of hydro to steam for the Roanoke Rapids project if none of the Buggs Island power is sold to the Company.

Q Are there any advantages to the Company from the Roanoke Rapids project which have not been included in your evaluation?

A Yes, there are several advantages for which it is extremely difficult to establish a monetary value. As pre-

viously stated, the location of the Roanoke Rapids project at the center of a load area and at the center of an existing transmission network will increase to some extent the reliability of power supply in that area by providing generating capacity locally and make the area less subject to interruptions or disturbances caused by transmission line outages.

The substantial size of the capacity provided by the project will also improve to some extent the voltage regulation [R. 141] in the area.

The operation of such a peaking hydro station will make a decided improvement in the light load operating conditions of the Company's larger steam generating units throughout the system. These large generator units and boilers operating at higher pressure and temperatures are not readily adaptable to operation at extremely light loads and neither are they adaptable to frequent stopping and starting on account of the resultant expansion and contraction of their component parts. Such operation would result in greater maintenance cost and undoubtedly reduced life of the equipment. The relation of our on-peak and off-peak loads is expected to be such in the near future that with the addition of several large steam units the operation of the steam stations during light load periods will become a serious problem. The Roanoke Rapids project will make unnecessary a similar amount of steam capacity that would otherwise be required without aggravating this off-peak operating problem as there are no difficulties in reducing a hydro generating station to extremely light loads.

Q In view of your evaluation of the capacity and energy to be obtained from the proposed Roanoke Rapids project, will you now state whether the proposed project is economically feasible and desirable for development by the Company, in comparison with the cost to the Company at its other

power plants throughout its system, and in comparison with other power [R. 142] supply that might be developed or made available?

A Yes. In my opinion the project is economically feasible and a very desirable development for the Company because, as shown in Exhibit 15, the cost to the Company will be substantially less than if the same amount of capacity is made available by installing the same type of steam capacity as is currently being installed by the Company and also because the project, on account of its location almost adjacent to our existing substation at Roanoke Rapids and at the center of our transmission network in the southern part of the system, will substantially improve the quality and reliability of service rendered in that area. In regard to its economical feasibility in comparison with other power supply which might be developed or be made available, the alternate steam program used in Exhibit 15 is in my opinion the program which gives the lowest over-all cost of any other power supply program that the Company might use as an alternate to the hydro program.

* * *

[R. 147] By Mr. Moore:

Q Mr. Cary, just before the adjournment I had asked you a question with regard to Exhibit H filed with the amendment. I had asked you to comment on that. Will you proceed with your answer?

A Neither irrigation nor reclamation is involved in any project or basin plan or in the plan contemplated by HD 650. We have given considerable study to the manner in which the project would be operated. During more than 90% of the time, the project would operate as a peaking generating station; that is, it would utilize the flow of the river to generate power on week days during the period from approxi-

mately 7 a. m. to 11 p. m. during which time the project would discharge water at substantial rates varying up to the full capacity of the plant, approximately 18,000 cfs. During other hours of the week, the project normally would store the flow of the river, passing such amounts of water as may be found necessary to maintain a minimum flow at least sufficient for municipal water supply, sanitation, and for the protection of fish and wild life, which flow will always be as great as the minimum natural flow of the river and during certain seasons of the year [R. 148] may be substantially greater than the minimum natural flow. For the protection of navigation at Weldon, North Carolina, and below, the increase and decrease in the discharge of water from the project will be so controlled as to avoid dangerously rapid rise or fall of the water level at Weldon.

Q Will you comment on the matter as to possible protection of navigation?

A I have just commented there on the protection of navigation at Weldon and below, as to how we would operate the project.

Q How about flood control?

A During flood periods the project would be so operated as to conserve in full the benefits from flood control operations at Buggs Island.

Q Have you prepared a table setting forth the anticipated capabilities of your system in 1953?

A I have.

Q Is the table which we are now handing you that table?

A It is.

Q Was this prepared under your supervision?

A It was.

MR. MOORE: We ask that this Exhibit be received as Exhibit number 16.

* * *

[R. 149] Q Will you now comment on the facts shown on this table, Mr. Cary?

A This table shows the dependable capability of the various components entering into the total capability for carrying the system peak load in 1953. I wish to point out that the peak load on the system of the Virginia Electric and Power Company is a relatively sharp peak of only about one hour's duration which occurs in the evening usually from about 5 to 6 p. m. during the month of December. This is the critical peak which determines the amount of facilities required on the system. The loads which occur in the mornings and have a duration of several hours are of substantially less magnitude and are not critical in that they do not control the amount of generating facilities required by the system.

* * *

[R. 150] Q In your judgment, is the proposed Roanoke Rapids project involved in this proceeding economically feasible for the Applicant, even if the Applicant purchases the entire output, or a substantial part of the output, of the Buggs Island project, and, if so, will you kindly state your reasons for your conclusions?

[R. 151] A Yes, it is, because the loads expected in 1953 and 1954 will require power capacity of such magnitude that the Company will need, in addition to its presently authorized additions to its steam stations and the capacity of the Roanoke Rapids project, substantial additional capacity which will have to be supplied either by the installation of additional generating capacity or by the purchase of capacity. We estimate that the 1953 peak load will be 780,000

kw. If we are granted a license and construct the Roanoke Rapids project and also purchase the entire output of the Buggs Island development, we shall have a total dependable capability of 896,000 kw, which on our present estimates of load, would create a reserve capacity of approximately 15%. Capacity reserves of between 10% and 15% on a system such as ours are generally considered entirely normal and reasonable to provide for emergencies and unexpected load growth.

If our negotiations for the purchase of power from Buggs Island result in our obtaining only one-half of the output of that development, our reserve capacity in 1953 would be only about 9%, which is slightly less than we consider adequate.

In 1954, we expect a system peak load of 815,000 kw. With the Roanoke Rapids project in operation and assuming the purchase of all of the output of the Buggs Island development, [R. 152] our reserve capacity would be approximately 10%, which is barely adequate and indicates the imperative need for additional capacity the following year.

* * *

[R. 154] Q Will you proceed?

A The Roanoke Rapids and Buggs Island developments will have a combined capacity of approximately 200,000 kw.

It is, therefore, obvious that if we should purchase the entire output of the Buggs Island development, 110,000 kw of the combined output of the two developments would be absorbed in the immediately adjacent areas and that approxi- [R. 155] mately 90,000 kw would have to be transmitted beyond this area. Based on the network analyzer studies previously referred to, it is our opinion that at least 25,000 or 30,000 kw would flow through the existing transmission lines through the Carolina Power and Light Company, and in effect be delivered to the western part of our system through the proposed interconnections with the Appalachian

Electric Power Company at Hinton, West Virginia and Altavista, Virginia, previously referred to and shown in green on Exhibit [17]. The remaining 60,000 kw would be transmitted to the Petersburg-Richmond area and the Suffolk-Norfolk area over the existing transmission lines with the second circuit added to the Roanoke Rapids-Suffolk line. Such operation would be entirely reasonable and practicable as these transmission lines will have adequate capacity for this purpose. Furthermore, as the loads in the area enclosed in the red line increase in the years beyond 1954, it is obvious that more and more of the output of the two hydro stations would be absorbed in the immediately adjacent areas and less and less would be transmitted beyond.

Q In your judgment, if the Company's application for license is granted by the Commission for this project, will your Company's ownership and operation of the proposed Roanoke Rapids project adversely affect the ability of the United States Government to market to your Company the power [R. 156] from the Buggs Island development.

A In my judgment it clearly will not.

* * *

[R. 157] Q Will you now explain how the operation of the Roanoke Rapids project would be coordinated with the Buggs Island project?

A Our studies indicate that only a small portion of the storage capacity of the Roanoke Rapids project will be necessary in order to properly coordinate the use of water at Roanoke Rapids with the discharge of water from Buggs Island. If we are sold the output of the Buggs Island project we will so coordinate the schedule of deliveries of power from Buggs Island that the water released from that project will be efficiently used at Roanoke Rapids. If the output of Buggs Island [R. 158] should be sold to other utility sys-

tems, private, R.E.A. or municipal, the release of water from Buggs Island will undoubtedly follow the same general pattern of operation as if we had purchased the power and the release of water would be such as to fit in with the planned operation of the Roanoke Rapids project. Any normal deviation from such planned usage can be readily taken care of by the use of the storage available at the Roanoke Rapids project.

Q What existing systems are there in the Buggs Island area capable of purchasing and absorbing all of the Buggs Island power at the expected load factor?

A Only the four power companies in the general area have systems capable of absorbing the entire output of Buggs Island at the expected load factor. These are Virginia Electric and Power Company, Carolina Light and Power Company, Duke Power Company, and Appalachian Electric Power Company. Of these, only Virginia Electric and Power Company and Carolina Power and Light Company will be the logical purchasers of the Buggs Island output. This is true because their systems are located in the immediately adjacent area with existing transmission lines extending practically to the Buggs Island site. To transmit the Buggs Island output to either Duke Power Company or Appalachian Electric Power Company would require substantial investment in new transmission facilities or the transmission of power through the systems of the other two [R. 159] companies for considerable distances.

Q What is the situation as to absorption of power from the hydro development at Roanoke Rapids?

A Here again, only the power companies are capable of absorbing the output of the Roanoke Rapids project at the expected load factor. In this case, however, the system of

the Virginia Electric and Power Company appears to be the logical system to absorb the output of the Roanoke Rapids project. As I have described, the project lies at the center of the transmission network serving the Virginia Electric and Power Company system in that area.

Q What is the situation as to the absorption of all the power from the hydro developments in the Roanoke River Basin contemplated in the comprehensive plan as contained in House Document 650?

A The Roanoke River Basin is served by or is adjacent to the electric systems of the Virginia Electric and Power Company, the Carolina Power and Light Company, the Duke Power Company, and the Appalachian Electric Power Company. The total combined capacity of these four companies in 1953 is expected to be more than 4,000,000 kw. According to statistics recently published by the Federal Power Commission, these four companies in 1948 had peak loads totaling some 2,819,000 kw. If the load of these four companies continues to grow at the same conservative rate of increase used in estimating the [R. 160] future loads of the Virginia Electric and Power Company, the total load of these four companies in 1953 will be approximately 3,800,000 kw. On this basis the average increase per year will be approximately 200,000 kw. The total capacity of all of the developments, included in the comprehensive plan for the development of the Roanoke River Basin as described in House Document 650, is there shown to be 357,800 kw. It is therefore obvious that if the various sites are developed on any reasonable time schedule, the four adjacent utilities would have no difficulty whatsoever in absorbing the entire output of the Basin.

* * *

[R. 162] Q Have you any information on the amount of power required by the REA systems in Virginia and eastern North Carolina?

A Our information regarding the load of the eleven REA systems listed in the petition to intervene in this proceeding and the seventeen REA systems included in the eastern North Carolina group indicates that these twenty-eight REA systems had in 1948 peak loads totaling approximately 37,000 kw and an annual energy requirement of approximately 117,000,000 kwhrs. This indicates a load factor of 36%, but diversity of load on such a widespread group of systems would undoubtedly result in an annual load factor for the group as a whole of at least 40%.

Q Could these REA systems absorb any amount of power from the Buggs Island project or the Roanoke Rapids project?

[R. 163] A With two or three minor exceptions, these REA systems are not now interconnected. Most of them are customers of the power systems and have a relatively small amount of generating facilities of their own. The annual load factor of these REA systems combined would be 40% or more. They would not be able to absorb power at the low load factor for which these projects are designed of approximately 25% without making a very great investment in steam generating stations to carry their base load. If Buggs Island or Roanoke Rapids power were sold to such systems in any substantial quantity at a load factor of 40% or more, the effective capacity of the hydro project would be materially reduced or the remaining power from the hydro projects would be available at a load factor substantially less than 25% and therefore would have much less value to other prospective customers.

Q Do you have the figures available as to the loads of

the eleven intervening REA cooperatives in this proceeding?

A Yes, I do.

Q Will you give that for the record?

A For the eleven REA cooperatives in Virginia the peak load was approximately 21,600 kilowatts in 1948, and the annual consumption was approximately 75,000,000 kilowatt hours. That gives a load factor of approximately 40 per cent.

Q Will you now compare the additional facilities which you have described as necessary for your Company to absorb [R. 164] Buggs Island power while developing the Roanoke Rapids project with the additional facilities necessary for these REA systems to take their requirements from Buggs Island or Roanoke Rapids or both?

A These REA systems are spread out through a large territory surrounding these projects in an area extending approximately 280 miles north to south and 150 miles east to west. A transmission system designed to supply them from the projects adequately and with reliability would require hundreds of miles of transmission line with the associated substations, including high voltage switching equipment and synchronous condensers for voltage regulation. Also, to avoid substantial impairment in value of the power that they would not absorb in purchasing their requirements from these projects, they would have to construct steam plants. In result, there would have to be an investment many times the investment necessary for the power companies, or for this Company alone, to absorb and market all the power from the projects. The greater part of this additional investment would create a physical duplication of the existing power company systems.

* * *

[R. 394] Q Do you recognize, Mr. Cary, that by reason of this [R. 395] upstream improvement at Buggs Island your company, if it is granted the license for which it applies at Roanoke Rapids, will derive considerable benefits?

A We will derive benefits.

Q Have you any way of approximating them?

A Yes. I think the benefits can be approximated.

* * *

Q Now, irrespective of what the Federal Power Commission may or may not ultimately do, what was the figure that you arrived at?

A My calculations indicated that the maximum possible benefit from the Buggs Island development would be $261,000 annually.

* * *

CROSS EXAMINATION

[R. 447] Q Now, considering that the natural flow is as much as 18,000 feet, about eight and a half per cent of the time, would you say that you would depend to a very large extent on the storage at Buggs Island?

A We would not be dependent on it at all for capacity. The storage at Buggs Island, if it is operated the way the Army Engineers contemplated it would be operated in their Definite Project Report, would increase the amount of energy available from the Roanoke Rapids project, but not any increase in capacity. That—

Q You have heard the testimony of Mr. Uhl—

MR. MOORE: Wait a minute, now, you interrupted the witness.

CHIEF PRESIDING EXAMINER: Did you finish your answer, Mr. Cary?

MR. CARY: I was simply going to change the last word to "dependable" capacity.

* * *

[R. 449] Q Now, will you tell us what you mean?

A I mean that as much of the time as our system load would require it, we could get 91,000 kilowatts out of that project.

* * *

[R. 450] Q For how long could you use 91,000 kw. during periods of low stream flow?

A I don't know.

Q Do you have any way of determining that?

A I guess it could be determined, but as I see it, it would have no practical significance.

* * *

[R. 451] Q I believe you said you would have 91,000 kw. whenever you needed it.

A That is correct, I did say that.

Q For how long do you figure you would need it?

A The full 91,000 kilowatts of capacity would only be needed during those short evening peaks that occur in the winter months, the latter part of November, December and January.

Q For how many hours?

A Usually about one hour per day.

* * *

[R. 453] Q What do you call the low flow period, which part of the year?

A The lowest flow period is the latter part of the summer and the early fall.

Q And during that time you say you will need that capacity of 91,000 for only one hour a day?

A No, I did not say that. I said during that period I would not need the full 91,000 kilowatts at all.

Q How much will you need?

A I don't know, but it is substantially less than 91,000.

Q Substantially less can be what, 60,000, 75,000? Would that be substantially less?

A I can't answer that question the way you have put it because loads vary, of course, from year to year. Our other sources of supply vary from year to year.

In making our study we determined how much steam capacity [R. 454] was necessary in order to carry the maximum peak, at the time of that peak. Then we assumed that those same facilities, whatever they are, were available during the rest of the time and we determined that the Roanoke Rapids project would carry that part of the system load in all months that could not be carried by those other facilities.

Q Then in making those studies you must have made certain load curves?

A Oh, yes.

Q Can you furnish copies of those curves for the use of our engineers?

A They can be supplied. I might add that the load curves, or rather similar data, is on file with the Federal Power Commission and can be available to anybody that wants them. That is where the Army Engineers got it.

* * *

[R. 458] By Mr. Hankin:

Q Suppose, Mr. Cary, the Secretary decides to sell the output of some 100,000 kw. to operate a wind tunnel for testing at night, the sale being made to the National Advisory Council for Aeronautics, would that affect your operation at all?

A I don't think that would affect our operations in the least.

* * *

[R. 464] Q How did you arrive at this figure of $261,000?

A By subtracting from the $404,000, which is the figure developed on Exhibit 15 as the excess of the annual cost of an equivalent steam program over the hydro program involving this particular project; then I made a similar calculation to determine what the same excess of annual cost would be for a complete program, using the Roanoke Rapids project on the assumption that the Buggs Island development was not in existence and comparing that with an equivalent steam program.

By exactly the same method of computation I arrived at a [R. 465] figure of $143,000. The $261,000 is simply the difference between those two figures, and as I stated yesterday, it represents the maximum possible benefits to the Virginia Electric and Power Company—if it goes ahead with this project—as a result of the Buggs Island development. But it does not indicate in any way the payments that will have to be made. And I would like to distinguish between the determination of benefits and the determination of payments.

* * *

By Mr. Hankin:

Q You say that you arrived at the $261,000 by determining the excess of annual cost of steam over hydro of Roanoke Rapids without the existence of Buggs Island?

A That is correct.

Q How did you arrive at that figure?

A I think I just answered that question. By making a similar computation as that shown on Exhibit 15—

Q Do you have that computation available?

[R. 466] A Yes, I do.

Q Right here?

A Yes.

Q You mean to say you have a computation of Roanoke Rapids without Buggs Island operation?

A Yes.

Q Can you make it available to us so that we might be able to examine it?

A It can be made available.

Q Will you do it?

MR. MOORE: We would be very glad to make that one available, sir, right now.

CHIEF PRESIDING EXAMINER: Very well, you may do so.

MR. MOORE: We ask that it be received as Exhibit No. 28.

CHIEF PRESIDING EXAMINER: It will be identified as Exhibit No. 28.

* * *

[R. 491] Q You have heard Mr. Uhl testify that the average annual energy output from the Roanoke Rapids project, as computed by the Charles T. Main Company, was adjusted by you somewhat?

A Yes, sir.

Q Will you explain to what extent those figures were adjusted?

A The figure given to me by Charles T. Main, and which was used in my calculations, was 375 million kilowatt hours for the output of the existing plant at Roanoke Rapids, combined with the Roanoke Rapids project as contemplated under the application. Subsequent to giving me that figure of

375 million [R. 492] Charles T. Main found a minor error and revised that figure upward, I think, to 380 million. In my calculation I did not—or to put it the other way around, I did not correct my calculations for that error because I considered it too minor and would not materially influence the results obtained. So I have used his original figure of 375,000,000.

I adjusted that figure to determine the output of the project in the consideration here, by subtracting from the 375 million, 30 million kilowatt hours, which is my estimate of the amount of that 375 that would be generated in the existing plant.

* * *

DIRECT EXAMINATION

[R. 498] Q If any reasonable use were made of the Buggs Island project, considering the installed capacity, storage, inflow to the reservoir, could you use the Roanoke Rapids plant to supply the 91,000 kw. of dependable capacity on the load of the company?

A Yes.

Q If the Secretary of the Interior undertook to market the surplus power from Buggs Island in conformity with the policy laid down in Section 5 of the Flood Control Act, which requires [R. 499] that, quoting, such power should be "disposed of", "Dispose of such power in such manner as to encourage the most widespread use thereof at the lowest possible rates to consumers consistent with sound business principles," could you use the Roanoke Rapids plant to supply the 91,000 kilowatts of dependable capacity on the load of the company?

A Yes.

* * *

[R. 1686] Q Would it be in the best interest of the public for the government to supply the entire requirements of its preferred customers from the Roanoke River projects?

A In my opinion, it would not.

Q Will you please explain your reasons for that opinion?

A The incremental cost of off-peak steam power is far less than the cost of hydro power. If the government should supply all of the requirements of its preferred customers from the hydro electric plants on the Roanoke River, it would be using relatively high cost hydro-electric power to supply the requirements of these customers during the off-peak periods. This would leave less of that power available for the on-peak periods. Such use of the hydro-electric power during the off-peak periods would only displace relatively cheap off-peak [R. 1687] generation in the steam stations of the utility system, which should be used during such periods.

The government's hydro plants should be operated as peaking plants as was intended and clearly indicated by the design of the Buggs Island plant for an ultimate installation of 204,000 kilowatts under which condition it would operate in a year of low river flow at a load factor of about 11.2 per cent.

If operated as peaking plants and closely coordinated with the steam generation of the major utilities in the area, the output of such hydro-electric plants will create the maximum benefits possible by eliminating to the maximum extent possible the need for additional steam generating facilities which otherwise would be required in the area.

* * *

[R. 1688] Q Mr. Cary, you have heard Mr. Hamilton's testimony where he stated on page 1221, lines 14 through 24 of the transcript, that the pondage at the proposed Roa-

noke Rapids project would not be usable. Do you agree with his statement?

A No, I do not.

Q In your study of this problem, have you assumed that the pondage would be used?

A Yes, I have.

Q Will you explain how and to what extent you plan to use the pondage at the proposed Roanoke Rapids project?

A We had this matter studied very carefully for us by Charles T. Main, Incorporated, and their findings are contained in Exhibit 29 of this proceeding in the paragraph beginning at the bottom of page 4, and extending over to page 5.

Our studies have been made on the basis that both Buggs Island and Roanoke Rapids would be operated as peaking plants and [R. 1689] would be in operation for about 16 hours per day, not counting the minimum flow operation during the off-peak periods.

As stated in Exhibit 29, there is a time lag of about eight and one-half hours required for the water released from Buggs Island to reach the pond of the Roanoke Rapids project. This will require the Roanoke Rapids project to operate for about the first eight and one-half hours of the on-peak period almost entirely from pondage, as the only inflow to the pond during this period will be from the off-peak discharge of water at Buggs Island, which we assume would be the minimum flow required.

On this method of operation, the pond at Roanoke Rapids would be drawn down continuously during the eight and one-half hour period until the on-peak discharge from Buggs Island reached the Roanoke Rapids pond.

At that time further draw-down of the pond would cease and, under some conditions, may begin to rise.

At the end of the on-peak period generation the discharge of water from Roanoke Rapids would be reduced to the required minimum and the pond would continue to fill from the remaining on-peak discharge from Buggs Island.

By having our load dispatchers keep informed as to the generation and discharge of water at Buggs Island, they can so dispatch load on the Roanoke Rapids plant that the draw-down of the pond at the end of the on-peak period will be the proper amount, so that the remaining in-flow from Buggs Island will [R. 1690] fill the Roanoke Rapids pond by the beginning of the next on-peak period, without wastage of water.

Calculations made for us by Charles T. Main, Inc., show that the maximum daily use of the pondage at Roanoke Rapids under normal operating conditions would result in a draw-down of less than three feet with daily recovery. For average and low flow conditions they found that the average draw-down would be about one foot.

In view of these studies by Charles T. Main, Inc., of the use of the pondage at the proposed Roanoke Rapids project, and my own knowledge of operating conditions on the system of Virginia Electric and Power Company, I see no justification for the statement made by Mr. Hamilton.

Q Mr. Hamilton and other witnesses for the Secretary of the Interior several times expressed different interpretations of the testimony given by you appearing in the transcript at pages 147 to 148, and again at 446 to 454, in which you described how the proposed Roanoke Rapids project would be operated should the company be granted a license. Without going back over all that these witnesses have said, I will ask you to state further detail as to the manner in which the project would, as estimated by your company on the studies made of the project, be operated on the system of the Virginia Electric and Power Company.

A As I have testified, the proposed project would operate as a peaking generating station and would carry certain parts of [R. 1691] the company's peak loads between the hours of approximately 7:00 a. m. and 11:00 p. m., during weekdays. I did not mean to indicate that the plant would operate only five days a week, as I consider Saturday a week-day, nor did I mean to indicate that it would never operate on Sundays, if load conditions should require it.

Our estimate of the on-peak period is that it will average about 91 hours per week.

During these on-peak periods, the generation on the proposed plant would vary with the water available and during substantial periods would carry its full capacity for a large part of the on-peak period.

At other times, when less water is available, the generation at the project may be reduced to such amount that it would carry only that part of the system load which could not be carried by the steam generation and other sources of power on the system.

Under this latter condition, the generation at the project would vary from hour to hour throughout the on-peak period, varying from light loads up to a maximum which might be the full capacity of the project, but on some days would be substantially less than full capacity.

* * *

[R. 2960] By Mr. Gibson:

[R. 2961] Q Mr. Cary, much has been said in the evidence in this case presented through Mr. Hamilton and Mr. Creim in regard to your Exhibit 74, based on which those witnesses have prepared Exhibits 79, 80, 81, and 87. Will you kindly explain just why Exhibit 74 was prepared in the way in which it was prepared, and what it was intended to show?

A Exhibit 74 was prepared at the request of counsel for the Secretary of the Interior to illustrate, based on certain assumptions, how we expected to operate the Roanoke Rapids project during the week of peak load in December, 1953.

I had previously introduced Exhibit 61 particularly to show the effect on the expected operations which would result from the restrictions on rate of increase in discharge, assuming most extreme conditions of operation on the very top of the peak, which required the most extreme increase in generation.

In cross examination on this, Mr. Hankin was especially interested in having a chart of actually expected, rather than extreme and hypothetical, operation. Therefore, I prepared the series of Exhibits, 72 through 76, to illustrate actually expected methods of operation.

Q In your Exhibit 74, what were your basic assumptions as to water available, and why were they made?

A Since the Roanoke Rapids plant will be downstream from Buggs Island, it naturally follows that the Roanoke Rapids [R. 2962] plant must use the releases from Buggs Island together with the inflow to the river below Buggs Island. To make any estimate of operation of Roanoke Rapids, it was necessary to make some assumption as to the operation of Buggs Island and the corresponding release of water.

The only estimate then, and the only estimate now, of the operation of Buggs Island and its seasonal variation in releases is contained in the Definite Projection Report on Buggs Island, Exhibit 10. These estimates of operation were used in preparing all Exhibits 72 to 76, inclusive.

Q What average flow from Buggs Island in cfs did your Exhibit 74 assume?

A Approximately 7000 cfs.

Q Why did you use that figure?

A That is the release necessary to give the Army Engineers' figure for December power output in a year of critically low flow, as given in the Definite Project Report, in Exhibit 10. I assumed the same flow throughout the month, without any increase in the week of peak load.

* * *

[R. 2963] By Mr. Gibson:

Q Mr. Cary, it appears from Mr. Hamilton's Exhibit 79, which seems to be based on the load pattern which you have assumed in Exhibit 74, that in column (c) he has assumed an average daily flow of 4310 cfs. Why did you not use that figure in the preparation of your Exhibit 74?

A That is an average figure for the 332-day critical low flow period without seasonal variation of power requirements from Buggs Island. I used the figure for December power output from Buggs Island in the critical year as given by the Army Engineers in Exhibit 10.

Q In Exhibit 87, Mr. Creim's exhibit, the upper half gives in column (c), the assumption of an average daily flow in cfs from Buggs Island of 6850. Why did you not assume that figure?

A 6850 cfs is the over-all average regulated flow for [R. 2964] a long period of years and is also without seasonal variation. As I have explained, I used the December release taken from the Definite Project Report.

Q Then in the lower half of Mr. Creim's exhibit we again find the use where he assumed 4310 cfs. Again I ask, why did you not use such an assumption?

A For the same reason I gave as to Exhibit 79.

* * *

[R. 2967] Q Are we to assume that you would operate Project 2009 in the manner assumed by Exhibit 74 for all variations in flow that you might encounter, that you may have during the month of December?

A No. The operation shown on Exhibit 74 is only for the conditions assumed and the flow corresponding to those conditions. If the flow should be greater than assumed, the operation would be lower down on the system load curve, and [R. 2968] if the flow should be less than assumed; the operation would be higher up on the load curve.

Q * * * Mr. Cary, would such sales to such Federal agencies, or to other than utility systems, affect your plan regarding the [R. 2969] proposed operation of Roanoke Rapids project, or its feasibility? If so, will you explain to what extent?

A Such sales to Federal agencies or others than utility systems would not change the plan of operation. Such sales may result in somewhat different regulation of the Roanoke Rapids pond so as to re-regulate the flow released from Buggs Island for most efficient use on applicant's system load.

Most of the Federal agencies mentioned by Mr. Creim were of the industrial type or of the military or naval base or camp type. Such loads are reasonably regular in their power requirements and would not be substantially different from utility system loads, as utility system loads are made up partly of such loads.

The hour to hour operation of Buggs Island is of no significance in the operation of Roanoke Rapids. The Roanoke Rapids pond has ample storage capacity to regulate the flows which such sales would create.

* * *

[R. 2970] Q Mr. Creim testified that his operation of Buggs Island would not decrease the flow available at Roanoke Rapids below the natural flow. You have testified in this case that the operation described in Exhibit 61 would make the full 91,000 kilowatts capacity of the project dependable on the applicant's system load for the week of annual peak load in December, 1953. Would the natural flow in the critical month permit you to operate as described in Exhibit 61?

A Yes, it would. The type of operation shown on Exhibit 61 would require an average flow of 1825 cfs. The operation in other weeks of December would require less average flow because the week shown in Exhibit 61 is the week of peak load and such weeks rarely repeat.

The average required flow for the entire month, therefore, would be less than 1825 cfs. Exhibit 51, sheet 2, shows that the natural average flow in the critical December month was 2190 cfs in 1917. The required flow is less than [R. 2971] the natural flow available.

Therefore, the natural flow in the critical month will permit operation as described in Exhibit 61.

* * *

[R. 2973] Q If the release from Buggs Island were less than assumed in Exhibit 74, would the applicant operate the plant at the same position on the system load curve as in Exhibit 74, and with the pattern of load as shown on Exhibit 74?

A No.

Q Why not?

A The estimated energy available would be less if the flow were less, and the energy would be placed higher on the load curve where the horizontal band requires less energy. The upper and lower boundaries of the band and the 5,000

kilowatts of base load would still be equal to 96,000 kilowatts.

* * *

[R. 2974] Q Has there been shown in the record the uppermost position on the load curve at which the project and the existing plant could provide 96,000 kilowatts of dependable capacity on the applicant's system load?

A Yes. That is shown in Exhibit 61.

Q Does that operation require as much energy as that assumed by Exhibit 87?

A No, only a fraction of that amount.

Q What would your answer be as to Exhibits 74, 79, 80, and 81?

A Exhibit 61 only requires a fraction of the energy required by any of those other exhibits.

Q In describing these operations for locating the operation of the plant on the system load curve, I ask if you have prepared a chart which shows the relative locations on the estimated December, 1953, load curve at which you would operate the plant with the generation indicated on Exhibit 74 in the one case, and with the generation indicated on Exhibit 61 in the other case?

A Yes, I have.

Q Was this chart prepared from any new data, or only from data of record in this case?

A Only from data in the record. The chart places on one sheet the loads and generation described by three exhibits, [R. 2975] Exhibits 29, 74 and 61.

Q Is this the chart you have described?

A Yes, sir.

MR. GIBSON: I ask that this chart, described by Mr. Cary, be introduced in evidence and marked as Exhibit 92.

* * *

[R. 2979] Q You have testified as to variation of the position of the plant operation on the load curve in case of a varying amount of water available, or varying conditions. Will you please explain how you would vary the plant operation to derive full capacity and utilize all the energy from the water available under varying conditions?

[R. 2980] A [In Exhibit 92] The solid black area, together with the unshaded area below the horizontal line at the bottom of the chart, show how the applicant would operate the Roanoke Rapids Project and the existing plant on the load curve if operated only as required to be dependable on the load for 96,000 kilowatts with minimum generation. This operation has nothing to do with the existence or operation of Buggs Island. With or without Buggs Island this is the minimum required operation necessary to utilize the full capacity dependable on the system load.

It can be seen that the 5,300 kilowatts resulting from the assumed minimum flow requirement of 1000 cfs would operate continuously as a base load shown at the bottom of the chart. The remaining 90,700 kilowatts of capacity would carry those loads above 629,300 kilowatts, up to the peak of 7,200 kilowatts, and the plant would operate—

Q What was the top peak? I didn't catch the figure.

A 720,000 kilowatts, and the plant would operate during periods of rapid increase in generation in advance of the sharp peaks as indicated near the bottom of the chart, which generation would be used to displace generation on the steam stations.

To carry out such operation during this week of annual peak load in December 1953, an average river flow of only 1825 cfs is required.

[R. 2981] The cross-hatched areas, together with the unshaded area below the solid line at the bottom of the chart, show how the project, together with the company's existing plant at Roanoke Rapids, would be operated on the load curve under the conditions assumed in Exhibit 74. That is, assuming Buggs Island to be operating with the seasonal regulation of flow described by the Army Engineers for the month of December, as shown in Exhibit 10.

Under these conditions, substantially more water would be released from Buggs Island than would be required by the Roanoke Rapids Project to make its full capacity dependable upon the system load, but the Roanoke Rapids Project, together with the company's existing plant, would simply, using the universal language of operating engineers, move down on the load curve to a point where it would efficiently use all of the water released from Buggs Island, converting that into energy and carrying the load for longer periods.

The positions at which to operate on the load curve were easily determined by the use of the curve contained in Exhibit 29 entitled, "Integrated Kilowatt Hours Versus Kilowatts, December 1953." In this case, that is, under the assumptions of Exhibit 74, in addition to carrying the 5300 kilowatts of base load, shown at the bottom of the load curve, resulting from the assumed minimum flow of 1000 cfs, the plants could carry that 90,700 kilowatts block of load between system loads [R. 2982] of 484,300 kilowatts, and 575,000 kilowatts.

The additional generation shown by the cross-hatched areas at the bottom of the load curve resulting from a limitation of rate of increase of discharge would simply displace steam generation with a corresponding saving in fuel. Such operation would efficiently use the assumed average discharge from the Buggs Island project of about 7,000 cfs and

the additional in-flow to the Roanoke Rapids project from the drainage area below Buggs Island.

If the average in-flow to the project were any amount other than that assumed in Exhibit 74, the operation would be represented by a similar cross-hatched band of the same magnitude vertically of 90,700 kilowatts, but located lower down on the load curve in case the flow were greater, and higher on the load curve in case the flow were less.

The total generation represented by the total area of the cross-hatched band and the cross-hatched sections, plus the unshaded area at the bottom of the load curve representing the generation from the assumed minimum flow, has a direct relation to the average inflow to the project and it can be readily seen that by moving the cross-hatched band up on the load curve, the total area will be decreased, and by moving the cross-hatched band down on the load curve, the total area can be increased.

The actual control of such operations is a simple matter [R. 2983] of load dispatching which is common practice on utility systems.

Q Moving of the generation represented by the cross-hatched band, moving that up or down on the load curve would have what effect on the load factor of generation from the project, together with the existing plant?

A Moving the generation down on the load curve to use greater flow would result in increasing the load factor of the generation. Moving the generation up on the load curve to use lesser flow would result in decreasing the load factor of generation.

The load factor used in Exhibits 79, 80, 81, and 87 is not fixed, but is determined by the position on the load curve at which the plant is operated.

Q Would the operation of Buggs Island Reservoir, in

such a manner as to generate power for sales requiring energy to be supplied during irregular hours and in the off-peak hours, in any way affect the dependable capacity of the Roanoke Rapids project?

A Not at all. The pondage at Roanoke Rapids would be more than adequate to receive such irregular flows and permit use at Roanoke Rapids to serve the requirements of the applicant's system load. In fact, sales by the Administrator from Buggs Island during off-peak hours, such as on NACA loads, would require less use of pondage at Roanoke Rapids than on peak [R. 2984] sales, due to the time lag in the flow of water from Buggs Island to Roanoke Rapids. This factor was carefully studied by our engineers, Charles T. Main, Incorporated, and the results incorporated in Exhibit 29 on page 4.

* * *

CROSS EXAMINATION

[R. 3121] By Mr. Hankin:

Q Mr. Witness, will you say what is the content of Exhibit 80 according to your understanding of it?

A I will repeat again that it's my understanding that Mr. Hamilton put in Exhibits both 80 and 81 to show that Buggs Island contributed to the dependable capacity of the Roanoke Rapids project. Exhibit 80, he assumed that Roanoke Rapids had to operate exactly in accordance with the operation shown on Exhibit 74. And in running through that operation with the critical low flows in December, he naturally ran out of water and pulled the pond down at Roanoke Rapids to the full extent of the 5,000 cfs-days of storage which he assumed. Then from that time on Roanoke Rapids operated only on the inflow to the pond except over weekends he got some recovery of pondage but not enough.

He was aware of the fact that that was an impractical

operation so then he worked up Exhibit 81 in which he esti-
[R. 3122] mated an operation parallel—what he calls parallel to Exhibit 74. That is with the same shape of load pattern but much less actual generation. And then he ran through that operation, and I don't know that he did a good job of getting a proper load pattern even at that, because he ran out of water down about the middle of the month, used up all the pondage that he assumed was there.

If he had done the job properly, he would have found out what load pattern he could have carried. But what the intent of both of those exhibits was was to show that Roanoke Rapids could not operate on the load pattern of 74 with those critical low flows. There has been no claim that it could operate on that load pattern. There is no necessity for it to operate that way with those flows. And the whole objection to those two exhibits goes back to that false assumption that in order to be dependable the project had to operate as contemplated in Exhibit 74. There is no basis for that assumption.

* * *

[R. 3175] Q How can you say it is not a fact when you said that you would have to have a steam plant in order to operate when the hydro plant is moved out of the cross-hatched area?

A I made no such statement.

Q Well, isn't that a fact?

A No, it is not.

Q What would you operate when the hydro plant is moved out of the cross-hatched area?

A I would operate the same steam capacity that I was
[R. 3176] operating when the hydro plant was operating in the cross-hatched area.

Q But you would now operate it in the cross-hatched area, isn't that right?

A The assumed condition of operation.

Q Is it right or isn't it?

A I don't understand your question. It doesn't seem to make sense.

Q I said but you would operate that steam plant in the cross-hatched area, would you not?

A It doesn't make any difference where you operate the steam plant.

Q But I am asking the question, Mr. Cary.

MR. GIBSON: I object to the question, Your Honor.

MR. HANKIN: I would appreciate an answer to my question, not an argument. I am not trying to argue with you.

MR. GIBSON: I wish to object to any further questions about this and would like to state the grounds of my objection. My grounds are that, if Your Honor please, there is really no excuse for this hearing going on and on and on on the proposition that couldn't possibly be clearer than if you shuffle a deck of 52 cards you still have 52 cards and not 53. How can we accomplish anything further that will be useful in this hearing by Mr. Hankin drumming away at the questions that if you switch the two do you have three, and that is all there is to it. I object to this further repetition.

[R. 3177] CHIEF PRESIDING EXAMINER: Let's hear your pending question. Is there one?

(The reporter read the pending question.)

CHIEF PRESIDING EXAMINER: What steam plant are you speaking of? Are you speaking of a particular steam plant?

MR. HANKIN: I am talking about this steam plant, Mr. Examiner. If you will look at Exhibit 92—

CHIEF PRESIDING EXAMINER: I think I know what you are getting at and I think I would like to ask Mr. Cary a question. Now, the steam capacity you are speaking about, which at different times will occupy different sections of the load, is that the steam capacity which your company has today?

THE WITNESS: We either have it today or we have it authorized and under construction. Of course, as our system loads grow further into the future, we will need more steam.

CHIEF PRESIDING EXAMINER: I understand. But your view, as I understand it, is that it is just a choice of steam or hydro to furnish this additional capacity, is that true?

THE WITNESS: I would like to explain that to make sure we are not misunderstood. We have a major problem here as to whether or not we put in this hydro project or whether we put in an equivalent steam project.

CHIEF PRESIDING EXAMINER: That is what I meant when I asked you the question. That is the question before you now.

THE WITNESS: That is not what Mr. Hankin is talking about. [R. 3178] That is the big problem that faces the company. Which of these two things are we going to do? If we don't get the 91,000 kilowatts of hydro capacity, then we will be forced to go and get the 91,000 kilowatts of steam capacity. But if we do get the 91,000 kilowatts of steam capacity, then that will be the 91,000 kilowatts of steam capacity that we will not require. We don't need both. Now, the other part of that question is this. As to where you operate the various—

MR. MOORE: You said steam. Did you mean steam or hydro?

THE WITNESS: What I was trying to say was if we do get the 91,000 kilowatts of hydro capacity, then that is 91,000 kilowatts of steam capacity that we will not require. Now, the other matter comes into the operation, how you operate on this load curve with varying amounts of water. Let's go from one extreme to the other: Suppose the flow in the river is large following a very wet spell and there is plenty of water there to operate the project 24 hours a day at full load.

CHIEF PRESIDING EXAMINER: Then you turn the hydro on your base load.

THE WITNESS: Absolutely. We put the hydro right down on the base load and it operates 24 hours a day, 7 days a week, as long as the flow is available.

CHIEF PRESIDING EXAMINER: But if the flow is very, very low, then you probably use your hydro at the peak and shift your steam down to the base load.

[R. 3179] THE WITNESS: That is correct. When the hydro is operating at base load, at the bottom, then your steam is up in the peak. Then if you have the extreme low flows which are indicated by the operation of Exhibit 61—that is the solid black on this Exhibit 92—and you put the hydro project in the peak of the load curve in order to make it generate the 91,000 kilowatts with those low flows, then your steam moves down and carries the base load and the other loads in between.

Now, there are any number, an infinite number, of variations between those two extremes. You don't necessarily go from one extreme to the other. Then the operation indi-

cated by the cross-hatched area, on 92, which is the same as was shown on Exhibit 74, that is just an intermediate operation and it might be anywhere between the two extremes up and down the load.

* * *

[NOTE: The following is printed to correct an error in Petitioners' Appendix at page 869 which reverses the witness's answer.]

[R. 3181] BY MR. HANKIN:

Q Now, assuming again that you would have both plants, with the steam plant operating in the cross-hatched area when the hydro plant cannot operate in that area, how much of the fuel cost of $1,509,000 would be saved?

MR. GIBSON: Mr. Examiner, I object to the question. Mr. Hankin is continuing to pursue the assumption of double [R. 3182] investment for which there is no basis.

CHIEF PRESIDING EXAMINER: The issues in the case, and their subsidiary issues, cannot be determined at the moment, I would say, Mr. Gibson. The record is not complete. I shall have to let Mr. Hankin proceed on his theory to a reasonable extent. He contends, as I understand it, there would be a double investment, is that true?

MR. HANKIN: I am asking the witness to assume that he has to have both a hydro plant and a steam plant like the one shown on Exhibit 15, and I am asking him this simple question. Suppose that the hydro plant operates in the cross-hatched area, how much fuel is being saved? The fuel cost given is $1,509,000. He ought to be able to tell us how much of that $1,509,000 would be saved.

MR. GIBSON: That is the question I have just objected to as just useless padding of this record on a baseless assumption.

CHIEF PRESIDING EXAMINER: Can you answer the question, Mr. Cary?

THE WITNESS: Not exactly. That would take substantial computation. But on the basis of the assumption which he has made, with which I have no agreement whatever, there would be a substantial saving in the fuel bill as shown on that exhibit.

[In Petitioners' Appendix at page 869 "no disagreement" is printed in place of "no agreement."]

* * *

[R. 3186] BY MR. HANKIN:

Q Now, Mr. Cary, looking at Exhibit 92, you can always depend on having a power capability of 91,000 kw for one hour per week in December, but you cannot always depend on having a power capability of more than one hour per week in the month of December, is that correct?

A No, it is not.

Q Will you explain why that is not correct.

[R. 3187] A That is not correct because it has been demonstrated here in this proceeding that even with the extreme minimum flow of record, which occurred during ice conditions in December of 1917, there was greater average flow in the river than is required to make the 91,000 kilowatts dependable on the load, on the system load of the company, in the December week of maximum load. Now, if that is true, even if you had a series of weeks exactly like the peak week—that, however is very improbable. These peak weeks rarely repeat and at the most I would think I am safe in saying they never repeat more than once. So that this operation indicated by the black section at the top of Exhibit 92 represents the extreme condition in that regard, and we have shown that the river flow at that time even with the

assumed minimum release of 1000 cfs, which was assumed in preparing Exhibit 61, we had more water than we needed. Now it appears that the minimum release actually that will be required will be 500 cfs rather than 1000 which means that you have substantially more water, even in the condition of extreme minimum flow, than is required to make this project dependable on the system load. My recollection is that you have roughly twice as much water as you actually need, and for that reason you could make 91,000 kilowatts dependable in a number of hours, not continuously, of course, but certainly more than was normally, even unreasonably, to be expected from the load curves that we have had in the [R. 3188] past for many years and as we expect to have in the future for many years.

* * *

[R. 3198] Q And I believe that you testified on page 2287 and other pages of the transcript that the pattern that you would follow in the operation of the project in critical low periods would be Exhibit 74.

A If the release of water from Buggs Island were as assumed in the Definite Project Report.

Q But isn't that the critical flow that you assume on Exhibit 74? We do have Buggs Island.

A Yes.

Q Then why did you say that Exhibits 79, 80, 81 and 87 were incorrect because Exhibit 74 was applied as a test under those conditions?

A Exhibit 74 has nothing whatever to do with the testing of dependable capability. It is a pattern of operation which we expect on the assumption that the release in December 1953 from Buggs Island will be approximately 7000 cfs. If the release from Buggs Island is anything different

from 7000 cfs, the pattern of operation will be different from Exhibit 74.

* * *

[The following is printed to render intelligible the portion of the record inadequately given in Petitioners' Appendix at page 884.]

[R. 3210] Q Suppose you operate your proposed project on the peak of the system load in accordance with Exhibit 61, obtaining a power capability of 91,000 kw for one hour on Thursdays in December 1953. Then in 1954, or 1955, or several years later, it develops that the system load requires 91,000 kw capacity or capability at the top of the load curve for two hours on Thursdays in December. Then would the project be dependable on the system load?

A Yes.

Q Where on the system load curve represented by Exhibit 92 would you put the operations of the proposed project and at what capability?

MR. GIBSON: I object to this question and to the last question and to the series of questions in which Mr. Hankin is either not stating a proper concept of what this electrical problem is, or he is putting words in the mouth of the witness in constantly using the expression obtaining a power capability of 91,000 kw for one hour. I think the witness has cleared it up, but it [R. 3211] constantly comes into the record in the way counsel frames the question.

CHIEF PRESIDING EXAMINER: I realize that there is something in what you say, but the witness usually takes care of the matter in his answer.

Does that exhibit show power capability at all?

THE WITNESS: Exhibit 61?

CHIEF PRESIDING EXAMINER: Yes.

THE WITNESS: No, sir, it does not.

CHIEF PRESIDING EXAMINER: Of course that would be the short answer.

THE WITNESS: I think I have given an answer a number of times.

CHIEF PRESIDING EXAMINER: When counsel refers to power capability and what it shows, if it doesn't show power capability, it doesn't show it.

THE WITNESS: I don't know how many times I have said that, Your Honor. I have tried to make that as clear as I could.

CHIEF PRESIDING EXAMINER: You may proceed, Mr. Hankin.

MR. HANKIN: I did not get the import of the substitution, I did not hear it.

CHIEF PRESIDING EXAMINER: I asked the witness whether Exhibit 61 showed power capability at all, and he said no.

BY MR. HANKIN:

Q What is that 91,000 kw of which you are talking with [R. 3212] reference to Exhibit 61?

A It is the operation required under the conditions assumed in that exhibit.

* * *

[R. 3223] Q And you still think that in those circumstances the construction of the proposed project to obtain a capacity of 91,000 kw for one hour in the month of December is a sound undertaking from an economic and engineering standpoint?

A Will you read that question back, please?

(The question was read.)

THE WITNESS: The project is not being undertaken to obtain a capacity, a top capacity of 91,000 kilowatts for just one hour per week.

BY MR. HANKIN:

Q In the month of December?

[R. 3224] A In the month of December.

Q That is not a method which you would use for obtaining a dependable capacity? Suppose we change that to your peak capacity. Do you think it is a sound engineering investment, engineering and economic investment, to obtain a peak capacity over one hour in December under extreme low flow conditions? Do you still think that that is a sound undertaking?

MR. GIBSON: I object to the question on the ground that there is nothing in the record to support counsel's statement of the proposed purpose of the undertaking.

MR. HANKIN: If that is the objection, Your Honor, let counsel look at Exhibit 92, and let him look at those solid black lines.

MR. GIBSON: I object. The question ought to be rephrased, if it is proper at all.

CHIEF PRESIDING EXAMINER: Do you wish to rephrase it?

MR. HANKIN: No, I think it is quite clear. The witness understands it.

CHIEF PRESIDING EXAMINER: What is your answer, Mr. Cary, if you understand it?

THE WITNESS: I can't give a simple answer to it. I can answer it, but I would like to state it my way.

CHIEF PRESIDING EXAMINER: Of course you are entitled to do that if that is the most direct answer you can make.

THE WITNESS: I can say this, without any qualification, that I think the project will be a sound investment because it will [R. 3225] make 91,000 kw of capacity available on our system load, and will make unnecessary the installation of a corresponding amount of steam capacity, and for that reason it is a perfectly sound investment as has been shown on several occasions in this proceeding.

* * *

TESTIMONY OF C. P. SPELLMAN

DIRECT EXAMINATION

[R. 187] Q Mr. Spellman, will you kindly state your full name, address and present occupation?

A C. P. Spellman, 4402 Monument Avenue, Richmond, Virginia. My present occupation is director of Rural Electrification, Virginia Electric and Power Company.

* * *

[R. 189] Q Have you, for the purpose of illustrating in this case, the location of the points of supply of the various cooperatives who have intervened in this case, prepared a map showing these features?

A I have.

Q Is the map which I present to you the one which has been prepared as you described?

A It is.

MR. MOORE: We ask, your Honor, that this map be received in evidence as Exhibit No. 18.

* * *

[R. 191] Q How many of the cooperatives are shown without any transmission line facilities?

A Eight.

* * *

[R. 192] Q How many of the cooperatives, as shown on this map, are connected by transmission lines?

A None.

* * *

[R. 1639] Q Are you familiar with Exhibit No. 43, that is Mr. Wickard's letter, dated May 25, 1949, to Mr. Krug, previously referred to in this case?

A I am.

Q Have you, for the purpose of illustrating this case, the location of the points of supply of the 17 cooperatives in North Carolina, listed in Mr. Wickard's letter, Exhibit 43, prepared a map showing these features?

A I have.

MR. MOORE: Your Honor, we ask that this map, which is entitled, "Map of Eastern North Carolina, Showing Points of Delivery of Power to the Following (17) REA Cooperatives at December 31, 1949," be marked for identification as Exhibit No. 59.

* * *

[R. 1644] Q What were the total requirements during 1948 for the 17 cooperatives as you found from your investigation?

A Approximately 16,000 kilowatts and 46 million kilowatt hours.

* * *

[R. 1645] Q How many of the cooperatives, as shown on this map, are connected by transmission lines?

A None, to my knowledge.

Q Mr. Spellman, you previously testified that you prepared a map showing the location of the points of power supply of the 11 member cooperatives in Virginia, and this map has been filed as Exhibit No. 18 in this case. Have you also prepared a map showing the relative locations of these points of supply with respect to Buggs Island and also with respect to the 11 Virginia REA Cooperatives listed in Exhibit 43?

[R. 1646] A I have.

MR. MOORE: We ask, your Honor, that the map which has now just been presented, entitled, "Points of Delivery of Power to the Following 11 REA Cooperatives in Virginia at December 31, 1948," be marked as Exhibit No. 60.

* * *

[R. 1648] Q What were the total requirements during 1948 for all of the 11 cooperatives?

A Approximately 21,600 kilowatts, and 75 million kilowatt hours.

Q What per cent of the total 1948 requirements of all 11 cooperatives was supplied the five cooperatives at delivery points within 75 miles of the Buggs Island site?

A Approximately 46 per cent of the total non-coincident maximum demand and approximately 39 per cent of the total kilo- [R. 1649] watt hours were supplied the cooperatives at these delivery points in 1948.

* * *

Q What part of the kw demand and of the kilowatt hours lies within the 75 mile radius of Buggs Island in Virginia and [R. 1650] North Carolina?

A Approximately 37 per cent of the demand and 35 per cent of the kilowatt hours.

* * *

TESTIMONY OF J. G. HOLTZCLAW

DIRECT EXAMINATION

[R. 194] Q. Mr. Holtzclaw, will you kindly state your full name, address, and present occupation?

A My name is Jack G. Holtzclaw. I reside at 603 North Davis Avenue, Richmond, Virginia, and I am president of Virginia Electric and Power Company.

* * *

[R. 196] A I believe that Exhibits E and F fulfill their requirements for the purpose of this application, but I will say further that the company is prepared to go forward immediately with the acquisition of such land or flowage rights as may be necessary to complete the dam to the presently planned level.

* * * The company now has invested in land at Roanoke Rapids about $350,000.

* * *

[R. 197] A The power to be generated at the proposed Roanoke Rapids plant, namely, 91,000 kw of capacity and about 345,000,000 kilowatt hours per year, will during the first year after the completion of the project constitute only about one-eighth of Vepco's estimated peak load at that time and will produce about one-eleventh of the system energy requirements.

The design of the proposed development is such that it will be operated primarily as a peak load plant, producing energy chiefly during the heavy load hours of the day and storing water during the remaining hours. * * *

* * *

[R. 198] A * * * output in kilowatt hours in the 20 years from 1929 to 1948 increased more than four times that of 1934, the earliest year for which we have accurate records.

* * *

[R. 199] A * * * even during the depression years of 1930 to 1940, Vepco's kilowatt hour output increased 87 percent or nearly doubled. In the decade 1935 to 1945, for instance, the output increased 183.51 percent and the annual load increased 174.19 percent. Both load and output have more than doubled in each ten-year period since 1931.

* * *

[R. 200] Q Mr. Holtzclaw, from the standpoint of the management of the company, will you now state why the Roanoke Rapids project is now proposed for development by your company, having in mind its location in your service area, the available market for the power and energy to be produced; the relationship of the project to your company's other plants and transmission system, the relationship of the project to other nearby utilities and, generally, the desirability of conservation of natural resources in the area?

A The development of water power sites on the Roanoke River has been the subject of study by Virginia Electric and Power Company for nearly a quarter of a century. As I have stated previously, the company now owns practically all of the land needed for a development at Roanoke Rapids and a substantial part of the land needed for the Gaston development eight miles up the river. Approximately $165,000 has been expended by the company in the past years on studies made by engineers looking to the development of the Roanoke River. The [R. 201] last complete survey, prior to this application for determination of its potentialities as compared with steam was made in 1937, at which time it was a toss-up as to whether we would develop our so-called Site B at Roanoke Rapids or install a high pressure steam unit at Richmond.

At that time coal was about $4 per ton, delivered at our plant, as against approximately $10 per ton at the present

time. The study indicated that the monetary advantage in favor of the hydro-electric development at Roanoke Rapids at that time was substantial, but, in view of the greater need for power at our larger load centers at Richmond and Norfolk, it was decided to construct additions to our Twelfth Street Steam Plant in Richmond and Reeves Avenue Plant in Norfolk rather than make the hydro-electric development at Roanoke Rapids.

* * *

[R. 203] Now, the company's load in North Carolina and southern Virginia at that time was very small, consisting of a few towns and a large rural section and, therefore, the development at that time would have meant long distance transmission to the load centers around Richmond and Norfolk. This factor was an important consideration in deciding upon steam developments in Richmond and Norfolk. Since that time, in 1944, to be exact, the company has acquired by merger the Virginia Public Service Company which then owned all the lines serving the area to the west from Roanoke Rapids.

The present situation, since the merger with Virginia Public Service Company, is that Roanoke Rapids is a load center itself, serving rapidly growing loads in eastern North Carolina and southside Virginia. The project is, therefore, well located as regards loads in short transmission distance, and the ten-dollar coal as of today completes the case for its development.

In July, 1928, Virginia-Carolina Power Company of North Carolina, a subsidiary of Virginia Electric and Power Company filed application for a preliminary permit for two developments on the Roanoke River, namely, Site A at Clements Island, North Carolina, eight miles above Weldon. The preliminary permit was amended in August, 1931, to extend period of priority of the application for a license at

Site A. This permit expired in July, 1932. An application for a license for the development of Site B at Roanoke Rapids, was filed in August, 1929, and was [R. 204] withdrawn on January 31, 1935.

These developments were not undertaken as planned and the applications withdrawn or allowed to expire because of the business depression of the early and middle thirties. The matter was reviewed again in 1937 as I have stated, but no application was filed because of the decision to proceed at the time with further steam developments, the reasons for which I have given.

The development of the Roanoke Rapids site is certainly in keeping from the standpoint of conservation of natural resources since it develops practically all of the fall of the river capable of economical development, and will produce 91,000 kilowatts of capacity and about 345,000,000 kilowatt hours per year. On the basis of .9 pounds of coal per kilowatt hour, the operation of this development will save 155,000 tons of coal per year.

[From this point the testimony on marketability of all Roanoke River power is printed in the Petitioners' Appendix at pages 291-6 and then proceeds as follows:]

* * *

[R. 210] As I have previously testified, the power to be produced [R. 211] by all of the other proposed developments can be readily absorbed by the interconnected power pool of the four utility companies around the Roanoke River Basin. The flow of the Roanoke River is such that low load factor power in large quantities such as is proposed can only be used to advantage by large integrated public utility companies having steam generating capacity to handle base loads. As I understand it, the Buggs Island plant can probably operate at its full capacity less than 40 hours a week

under normal conditions. If the government should develop the sites at Roanoke Rapids and at Gaston, it would simply mean more power of this same general character to be sold by the government to the interconnected utility pool.

If Virginia Electric and Power Company is granted a license to construct this development at Roanoke Rapids, it is prepared to go to work immediately and thereby commence at an early date the utilization of the water power resources of the river. In my judgment, the development of the Gaston site by Vepco will naturally follow after the Roanoke Rapids site is completed, as conditions in the area justify its construction.

The construction of these two developments by Virginia Electric and Power Company will mean an increase in property value for tax assessments amounting to around forty to fifty million dollars for the four counties involved. The Roanoke [R. 212] Rapids dam and power house will have a taxable value in excess of the entire taxable values in Northampton County, North Carolina, in 1948, in which County most of the property will be. The government cannot build these dams any more economically or efficiently than Virginia Electric and Power Company can build them, and the government cannot operate the dams any more efficiently than Vepco can operate them.

With the completion of its present steam plant construction program in 1951, Vepco will need this hydro plant for a balanced system to handle peak loads; furthermore, it would have developed it long ago if the situation that exists today had existed then. * * *

* * * The conservation of natural resources will be just as complete if developed by private capital as if developed by the government. Taxes will be paid in large amounts if these developments are made by private capital. There is no element of flood control benefit [R. 213] in the Roanoke

Rapids or Gaston developments, as proposed in House Document No. 650, both being contemplated developments by the government for the sole purpose of making and marketing electric power.

* * *

TESTIMONY OF D. C. BARNES

[R. 225] DIRECT EXAMINATION

BY MR. MOORE:

Q Mr. Barnes, will you state your full name, address, and present occupation?

A Donald C. Barnes, Charlottesville, Virginia. I am Chairman of the Board of Virginia Electric and Power Company.

* * *

[R. 229] Q In view of this evidence and your own study of the company's present and future demands for power and energy, will you state whether or not you consider the construction and operation of the Roanoke Rapids project as proposed in the pending application, as amended, feasible and economical, giving your reasons for your answer?

A We have retained two outstanding engineering firms to investigate and design this proposed development and to report their findings. Their recommendations are incorporated in the application for license as amended.

Based on my knowledge of their ability and record of performance, I feel confident that the project as proposed is feasible from a physical standpoint, namely, that there are suitable foundations for the structures proposed, that the plant, when completed, will produce the power and energy for which it is designed, and that their estimates of cost are as accurate as it is humanly possible to estimate.

From my knowledge of Vepco's past, present and estimated future demands for power and energy, I am convinced

that the output of the project can be marketed advantageously through Vepco's system at a substantial saving in cost over that which [R. 230] the company would incur if, in the alternative, the company were required to substitute in its development program a like amount of steam generated power and energy.

Our estimate of load growth predicts a demand of 780,000 kw in 1953 as compared with 576,400 kw in 1948. This represents a load growth during this period at the rate of approximately 6¼ percent compounded annually.

Federal Power Commission data for energy generated and purchased by the industry as a whole show a rate of growth from 1920 to 1947 of 7.2 percent compounded annually, and for the period from 1934 to 1947 of 8.6 percent, whereas, in the latter period, the demand on Vepco's system as now constituted has grown at the rate of 10.6 percent compounded annually. It is, therefore, apparent that our estimate of load growth is conservative.

* * * *

[R. 232] The characteristics of the hydro developments in this area are such that because of the low load factor of their prime power and because of the large volume of dump power, their output can be most economically absorbed by large existing steam generating systems, which can use the prime power advantageously to carry the low load factor peaks of the system load and to take the swings of the load and can displace steam generation with the excess stream flows when available. It is apparent, therefore, that the Roanoke Rapids project, as proposed, is not only feasible from a market and use standpoint, but is most advantageous from an operating standpoint.

Economic studies made by our engineers and checked and concurred in by me show that the cost for fixed charges and

operation of the project will be less by some $400,000 annually than the cost of providing the same power and energy in a modern steam plant with coal at $9.34 per ton. Our average cost of coal in March, 1949, was $9.98 and, while there is presently a declining trend in coal prices, it is our opinion that they will [R. 233] not stabilize at a price low enough to eliminate this saving. It is, therefore, my opinion that the project is feasible and economical from every angle.

* * *

[R. 1710] MR. MOORE: Mr. Examiner, we now ask that this exhibit be marked for identification as Exhibit 62, it being entitled, "Estimate of Taxes Which Will be Lost or Shifted to Other Tax- [R. 1711] payers if Government Builds Roanoke Rapids instead of Virginia Electric and Power Company."

* * *

Q Mr. Barnes, will you now proceed to comment on what this exhibit shows?

A. This exhibit shows the estimated the taxes which will be lost or shifted to other taxpayers if the government builds the Roanoke Rapids project instead of Vepco.

The first item is Federal Income Tax, shown on Exhibit 48, Column D, line 8, in the amount of $747,000. This figure is based on present tax rates which the administration is urging be increased.

The next item is the amount of state and local government property taxes, shown in column D, line 13; in the amount of $304,000.

The next item is an estimate of the loss sustained by the Federal government from income taxes on taxable interest and dividends received by Vepco's security holders. This income would consist in round figures of interest payments of $385,000 and dividend payments of 90 per cent of $1,

219,000, namely, $1,097,000, making a total of $1,482,000.

[R. 1712] From this amount should be subtracted the amount which would be paid to investors, if the government develops the project, as shown on Exhibit 48, line 5, column G, namely, $545,000. Thus, the net loss in taxable income to the government would be $937,000.

This exhibit shows that if the weighted average tax bracket of Vepco's security holders is such as to bring their increment tax to the rate shown, the amount of the tax would be as indicated, namely, for the average tax rate of 16.6 per cent, which is equivalent to that applicable to personal incomes of not over $2,000, the tax would be $156,000.

* * *

[R. 1713] If the weighted average bracket is 82.1 per cent, which corresponds approximately to personal taxable incomes of over $200,000, the tax would be $769,000.

The corresponding total taxes which would be lost or shifted to other taxpayers would be as shown; if the applicable Federal tax rate is 16.6 per cent the aggregate would be $1,207,000.

* * *

If 76.6 per cent, the aggregate would be $1,769,000, and if 82.1 per cent, the aggregate would be $1,820,000.

Line 11 shows the sum of these annual taxes, lost or shifted, and the annual cost of operating the project if financed and operated by the government, as determined by Mr. Eardley in column G, Exhibit 48, in the amount of $938,000.

* * *

[R. 1714] It is not practical to estimate the loss or shifting of state income taxes on individual investors and personal property taxes of the individual investor, but there would be such a loss.

Q Do you know of any other taxes that would be lost

or shifted to other taxpayers if the government builds and operates the Roanoke Rapids project?

A If the Government sells direct to the Co-ops and public agencies, electricity which would otherwise be sold as Vepco, the State of North Carolina would lose the six per cent gross revenue tax which Vepco would otherwise pay on such sales in that state, and Virginia would lose its three and a half per cent gross revenue taxes on such sales in Virginia, and West Virginia would lose its four per cent tax on such sales [R. 1715] in that state.

In addition, to the extent that the Co-ops and municipalities retail electricity which would otherwise be sold by Vepco for residential or commercial uses, the Federal Government would lose the three and a third per cent tax which it levies on such sales by private utilities.

The burden of these lost taxes would have to be shifted to other taxpayers. These taxes were properly not included in Exhibits 15, 48 and 50 because they constitute a part of the cost of marketing electricity, while these Exhibits purport to show the cost of production.

Q Did you hear Mr. Eardley testify at page 1495 of the record that private utilities could finance, in his judgment, 100 per cent of their construction requirements at an interest cost of two per cent?

A Yes.

Q What is your opinion on that subject?

A Such a claim is fantastic. It could only be approached if the private utilities had the same taxing powers as the government and the same control over the money supply and credit policy of the country.

* * *

TESTIMONY OF ADOLPH G. SUNDA

[R. 566] DIRECT EXAMINATION

BY MR. COSTELLO:

Q Will you please state your name and address for the record?

A Adolph G. Sunda, Alexandria, Virginia.

Q Will you please state by whom you are employed and in what capacity?

A I am employed by the Federal Power Commission, Washington, D. C., as hydraulic engineer in the Special Analysis Section of the Division of Licensed Projects, Bureau of Power.

* * * *

[R. 576] Q What are the advantages of Project No. 2009 over the project outlined in House Document No. 650?

A The advantages of Project No. 2009 are:

(1) Eliminates the construction and maintenance of a power canal about eight miles long;

[R. 577] (2) Necessitates the construction and operation of only one and not two powerhouses;

(3) Permits greater flexibility and reliability of powerhouse operation;

(4) Permits all flow to pass down the stream bed of the Roanoke River;

(5) Is more economical, and;

(6) Has an installed capacity of about 32,000 kilowatts more than the project outlined in House Document 650.

* * * *

[R. 584] Q What is the staff's estimate as to the average annual energy output from Project No. 2009?

A Based on reservoir operation of Buggs Island project for the period 1912 to 1945, inclusive, as shown on plates 27

and 55, in Exhibit 10, Definite Project Report on Buggs Island Reservoir, estimated average annual energy output from Project No. 2009 would be about 308 million kilowatt hours.

* * *

[R. 585] Q What is the staff's estimate of the average annual value of capacity and energy of Project No. 2009?

A The estimated average annual value of the capacity and energy would be about $3,218,000 based upon a value of $22.54 per kilowatt of capacity and 3.79 mills per kilowatt hour for energy.

Q Why do you use the capacity value at $22.54 per kilowatt of capacity and the energy value at 3.79 mills per kilowatt hour?

A These figures represent the cost of supplying the equivalent amount of capacity and energy from an alternate new steam electric plant. The capacity charge of $22.54 represents the annual fixed charges and operating costs and the energy figure of 3.79 mills represents the variable operating and maintenance costs and fuel charges.

* * *

[R. 586] Q * * * what do you estimate the cost of the project to be?

A The estimate of cost is $27,233,000.

[R. 587] The Roanoke Rapids project No. 2009 would be economically [R. 588] feasible and would be adapted to a comprehensive plan for the development of the Roanoke River with pool at either elevation 127 or 132, as long as there is no reduction in head at the combined Gaston and Roanoke Rapids sites.

Q What are your conclusions as to the proposal of the applicant, Virginia Electric and Power Company, to con-

struct Project No. 2009, so far as concerns its economic feasibility and its adaptability to the most comprehensive plan for developing the water resources of the region for improving the Roanoke River for the use or benefit of interstate commerce, for the improvement and utilization of water power development and for other beneficial public uses, including recreational purposes?

A In my opinion, this proposed Project No. 2009 is economically feasible and would be best adapted to a comprehensive plan for the purposes which you mention.

* * *

[R. 711] CROSS EXAMINATION

BY MR. COHN:

Q Mr. Sunda, you testified in your direct testimony the Roanoke River Project described in House Document No. 650 had as its sole purpose the generation of hydro-electric energy, is that right?

A That is correct.

Q Is that fact clearly apparent from the data given in House Document 650?

A Yes, it is.

* * *

[R. 745] REDIRECT EXAMINATION

BY MR. GATCHELL:

Q Did you make a field inspection of the Roanoke River?

A I did, at the site of the proposed project, and also of the center line of the canal, of the proposed canal outlined in House Document 650 for the Roanoke Rapids Project at accessible points.

Q Does Exhibit 11, plan "D", call for an enlargement of the canal?

A It does.

Q Did you inspect the canal that is covered by that plan?

A I did.

Q Had there been any improvements—houses, and so forth—along the right of way of that canal?

A There has been some improvement.

Q Would that affect the feasibility or economy of constructing that canal?

A It would affect the canal economy by increasing the cost of purchasing the right of way for the canals, as outlined in Plan "D" and in House Document 650.

Q Has there been any construction since the two plans were submitted—House Document 650 and Exhibit 11?

A Considerable housing and some buildings have been [R. 746] built along the canal right of way since the report on 650 was prepared.

Q Not speaking of the Army Engineers, but of your own professional opinion, have these improvements changed the economy of constructing that canal?

A It has.

Q In what way? Has it made it more favorable or less favorable?

A Less favorable. One reason would be, as I mentioned before, the higher cost of purchasing and condemning the lands on the right of way, and also the project would tend to restrict the expansion of the City of Roanoke Rapids in the direction of where the canal is to be constructed.

Q Has the hydraulic capacity of the Buggs Island power plant, that is the portion to be used for power—has that

been modified from what was proposed in House Document 650?

A It has.

Q Is that modification substantial, in your opinion?

A It would be substantial.

Q The factors which you have mentioned in connection with the canal and Buggs Island power features—have you any views as to whether that would require a reconsideration or restudy of the Roanoke Rapids project as outlined in House Document 650?

* * *

[R. 747] A Yes, Exhibit 10. . . . any project located downstream from the Buggs Island project must take into consideration the changes that were made in the Buggs Island project.

* * *

[R. 3010] Q Have you examined Exhibits Nos. 80 and 81, introduced by the witness Hamilton, as evidence?

A Yes, I have.

[R. 3011] Q Do you agree with his testimony that the Roanoke project requires water from the Buggs Island project over and above the natural flow of the Roanoke River during the critical week of adverse flow in December, 1917, to make the project dependable on applicant's system load?

A No, I do not.

Q Why do you not agree to that?

A I have made a study to show that the Roanoke Rapids project is dependable on applicant's system load with the natural flow of the Roanoke River during the critical week of adverse flow in December, 1917.

Q Will you please summarize briefly the results of this study?

A Dr. Jessel has testified that 909,000 kilowatt-hours of energy must be generated by the project in a week of December, 1953, to meet the system peak demand and make the project dependable to 91,000 kilowatts on the applicant's system load. Considering the 500 second feet continuous minimum release which generates a constant output of about 2650 kilowatts, the energy demand for peaking is reduced to about 839,000 kilowatt-hours.

In order to generate 839,000 kilowatt-hours in a December week, a flow of about 6620 day second feet of water would be required. A continuous minimum release of 500 second feet requires a flow of 3500 day second feet in one week. Flow [R. 3012] requirements for both peak energy and continuous minimum releases would be about 10,120 day second feet in a December week.

Examination of Exhibit No. 80 shows that the week of most adverse flow is the week of December 24 to 30, with a total flow of 7700 day second feet. The natural flow in the previous week was 14,850 day second feet, which was about 4720 day second feet in excess of the requirement for peaking power and continuous minimum releases.

With this flow in excess of requirements during the previous week, the reservoir would be full at the end of the week, which would make at least 5000 day second feet available in addition to the natural flow of 7700 day second feet, giving a total of about 12,700 day second feet available during the week for peak energy and continuous minimum releases.

The amount of water in excess of requirements is 2580 day second feet, and would be available for pondage for the following week, starting with December 31.

Q Were the stream flows of December, 1917, characteristic of flows which might be expected to occur in December of any year?

A No, they are not.

Q Will you describe the conditions accompanying the flows of December, 1917?

A Water Supply Paper 472 of the U. S. Geological [R. 3013] Survey, in evidence as Item B by reference, which contains the stream flow records of the Roanoke River at Old Gaston, North Carolina, for December, 1917, contains the following note:

"Discharge estimated, because of ice, as in table for December 12-13, 18-28, 30-31, and January 1-29, from observers' notes, weather records, and comparison with records at other stations."

* * *

[R. 3016] Q Is the load pattern assumed in Exhibit No. 87 such as to indicate the Roanoke Rapids project generating capacity would be placed in the peak or upper portion of the system load?

[R. 3017] A No, it does not. It follows the load pattern shown in Exhibit No. 74, which is a block of load considerably below the peak of the load curve.

Q Is there any exhibit in the record which shows the system load curve for the Virginia Electric and Power Company and the operation of the Roanoke Rapids project in the system peak?

A Yes. Exhibit No. 92 contains an estimated weekly system load curve for December, 1953, and Exhibit No. 61 shows a possible operation of Project No. 2009 in the week of annual peak in December, 1953, under adverse flow conditions.

Q What are your conclusions regarding the dependable capacity of Project No. 2009?

A My conclusions are the same as they were when I testified on the dependable capacity of the Roanoke Rapids project on pages 583 and 584 of the transcript.

In addition, the Roanoke Rapids project will have a dependable capacity of 91,000 kilowatts on the applicant's system load under natural stream flow conditions.

You will recall the statement by Mr. Creim, as it appears on page 2499 of the transcript, line 23, that he intends in the operation of Buggs Island to pass an amount of water equivalent to the natural flow of the river.

I would merely add to that observation that our studies have all shown that the natural stream flow during weeks of [R. 3018] adverse flow and annual system peak on the Virginia Electric and Power Company's system would be more than ample to enable the applicant to utilize the full dependable capacity of 96,000 kilowatts for the proposed and existing Roanoke Rapids plant without any additional releases from the Buggs Island reservoir.

Furthermore, if the Southeastern Power Administration passes the natural stream flow past the Buggs Island plant, as Mr. Creim says they will, there will be no necessity for any agreement by the company with the United States to insure an adequate supply of water for operation of the Roanoke Rapids project. If the Buggs Island project is operated efficiently to serve those customers for which the type of load is best suited, and I fully expect it to be so operated, there will be a sufficient supply of water for full utilization of the Roanoke Rapids project.

Finally, if there are any benefits conferred upon the Roanoke Rapids project by reason of the storage and releases of water at the Buggs Island project, I would fully expect the Federal Power Commission to assess and collect charges for such headwater benefits, as it is required by Section

10(f) of the Federal Power Act, a matter to which I did not hear Mr. Creim refer while he was on the stand.

* * *

CROSS EXAMINATION

[R. 3482] Q In other words, when you have a steam plant, let us say, of 72,000 kw, and you can overload for a short period by [R. 3483] as much as 25 per cent, you would say that the capacity of that project is worth $22.54 times 91,000, or times 72,000?

A No, your cost would be based, that is the primary cost of $22.54 would be based on 91,000, not on 72,000.

* * *

[R. 3490] Q Now, the project would not be operated according to Exhibit 74 and according to Exhibit 61 at the same time; would it?

A No.

Q Now, when the project is moved out of the cross-hatched area [in Exhibit 92], what will supply the power for that part of the load curve?

A It is assumed that the Virginia Electric Power Company has at this particular December week, December, 1953, 720,000 kilowatts of capacity. If you have the cross-hatched area operated by the hydro plant, then the top area represented by the black top part would be represented by steam plant, or some other method of generation.

If we move the hydro from the lower area, and shift it to the upper area, or the darker area, then the steam which is up in the upper area would be moved back down, and occupy the cross-hatched area.

Q In other words, you would use the steam plant?

A Don't misinterpret me. I have made my full explana-
[R. 3491] tion, Mr. Hankin.

Q I am not misinterpreting you at all. Tell me this:

How about that steam plant? Does the capacity of that steam plant have to be available all of the time so that whenever you move the project out of the cross-hatched area you will be able to substitute it?

A The capacity is already there. You are not holding back any additional capacity. As I said, VEPCO in this case would have a capacity available of 72,000 kilowatts, plus their spinning reserve. That is all the capacity it would have. There would be no additional capacity to stand by this 91,000, so that if you take this capacity from below, you would shift it up to the top to take the capacity from the top and shift it down below. It would be a question of shifting, and you would not require additional capacity.

Q That is an enlightening answer, but my question is this:

Would that capacity which would have to take the place of the hydro project in the cross-hatched area have to be available all of the time?

A It is available.

Q It would have to be available?

A Well, it is available.

Q Do you make a distinction between the two?

[R. 3492] A Yes; I do.

Q What is the distinction?

A The distinction that you already have it there, and you are not requiring additional capacity.

Q Now, then, is the capacity of that steam plant worth $22.54 per kilowatt?

A What steam plant?

Q The one that you would operate when the hydro plant is moved out of the cross-hatched area.

A I did not say we would have a hydro plant move in where the cross-hatched area moved out. You have a steam plant already in the system, and its value would be about $22.54 per kilowatt; yes.

Q I didn't quite understand your prefatory remark. You didn't say that the steam plant would be moved in when the hydro plant is out. You simply can't have that area remain idle, can you?

A I believe I made myself clear, or I tried to, Mr. Hankin; that as you move the hydro out of the cross-hatched area, you move it higher on the load curve—in your respect, you say move it on to the top—and at the same time you are moving that hydro higher up; you are taking steam which is already up on the top and moving it down, so you have no additional capacity to replace this hydro, which is down below. It is already there on the system.

[R. 3493] Q Now, then, I ask you whether the capacity of that steam plant which would operate would have a value of 91,000 times $22.54?

A The value of all the capacity which is for the 720,000 would likewise have a value of $22.54 per kilowatt.

Q When you say all the capacity, you mean the capacity that your move into the cross-hatched area when you move out the hydro plant?

My question was limited to that, Mr. Sunday.

A Any capacity—

Q I don't want to know about any capacity. I want to know about the capacity that you move into the cross-hatched area when you move the hydro plant out of it.

A You can't put your finger on any particular steam capacity which is moved either in or out. It is already there in the first place. You just transpose the positions.

Q You mean the capacity of the steam plant is already there while the hydro plant is there?

A That is right; in the system, not in that particular area, no; in the entire system.

Q I am talking about the cross-hatched area. Now, if you don't want to answer my question—

A I am answering your question.

Q You are not; you are talking about the entire load curve.

[R. 3494] CHIEF PRESIDING EXAMINER: I think he has answered your question at least three times in the last 15 minutes. It has now become very argumentative. I will ask you to go on.

BY MR. HANKIN:

Q Assuming that the value of the capacity of the steam plant will be 91,000 times $22.54, what will be the value of the capacity of the hydro plant which will not be operated in the cross-hatched area when the hydro capacity is not available?

A The hydro capacity is available and the value would be $22.54 times the 91,000.

Q You mean it will be available for that cross-hatched area?

A Not for the cross-hatched area. It would be available in that case, if you move it out of the cross-hatched area, it would be available for the blackened area.

Q Assuming that the capacity of the hydro plant is

placed at $22.54 per kw, or a total of over $2 million, what will be the value of the capacity of the steam plant which must be available whenever the hydro capacity is not available?

A We do not have double capacity, as I said before. The capacity just replaces itself, and the capacity which is on top before, its value is 91,000 times $22.54.

* * *

[R. 3500] Q But that 91,000 is capacity, isn't it?

A It is capacity requirement, that is correct.

Q. And that 91,000 of capacity is shown in the solid black lines [of Exhibit 92] for how long a time?

A The requirement for 91,000 is shown for one hour.

Q Please don't substitute for words I use.

A I cannot give you the other word, because the way I specify it is the way I understand the problem to be.

Q Then please state that you do not want to answer my question, but don't substitute your own words and answer some other question.

MR. GIBSON: I object to the argument.

CHIEF PRESIDING EXAMINER: Does that exhibit show capacity itself, or merely the requirements of capacity?

THE WITNESS: Requirements of capacity.

CHIEF PRESIDING EXAMINER: That ought to be clear enough, it seems to me.

* * *

[R. 3507] * * * I find that using the reservoir capacity of about 10,000 day second-feet, we can generate 40 per cent more energy than the 909,000 kilowatt-hours shown as requirement. Therefore I would say offhand that there is

sufficient water to take care of an additional two hours of peaking.

Q I asked about three hours.

A Also for three hours.

Q You haven't made any computations to show whether that would be possible?

A Not on the assumption you have made. However, I do know there is sufficient water to take care of additional energy requirement.

Q You mean that there would be sufficient water so that you would not have to operate in accordance with Exhibit 61, is that correct?

A Well, if you have three hours of operation, then you would change Exhibit 61.

* * *

DIRECT EXAMINATION

[R. 3518] By Mr. Gibson:

Q Mr. Sunda, Mr. Hankin asked you whether or not you agreed with Mr. Cary's testimony as to the estimate of operation in accordance with Exhibit 74.

Referring to page 2287 of the record, as a matter of fact, Mr. Cary's testimony at that point states that it was the company's estimate, his words were "our estimate," that that [R. 3519] would be the expected method of operation.

Do you disagree with the fact that that estimate was the company's estimate?

A No; I do not.

Q In expressing your possible disagreement, I think you said you did not necessarily agree. Your possible disagreement might be with the estimate itself, as I understand it?

A My only disagreement with the estimate would be its use to determine dependable capacity of the project.

Q Mr. Cary himself testified that Exhibit 74 was not a measure of dependable capacity. I think that witnesses for the Department of the Interior have used some of the assumptions of Exhibit 74 for their supposed measure of dependable capacity. I was asking as to the nature of your possible disagreement with Mr. Cary's statement that the company's best estimate of operations would be in accordance with Exhibit 74. Would the point of your possible disagreement turn on the flow assumed by Exhibit 74?

A Based on the data used by Mr. Cary, in determining the amount of water available to carry the peak load in December, 1953, Exhibit 74 appears to be a reasonable presentation of actual operations on the VEPCO load.

Q Is there any reason to believe that the operation shown in Exhibit 74 would be different if the flow is the [R. 3520] flow assumed by the exhibit?

A That would probably be the method of operation of the Roanoke Rapids project.

Q Is there any reason to disagree with the load curve given on Exhibit 92 taken from Exhibit 29, and of which Exhibit 74 was a portion?

A I have no reason to disagree with it.

Q As to the flow assumed by Exhibit 74, Mr. Cary gave an explanation on pages 2962 through 2964, and on page 2976, that the flow assumed by that exhibit was taken from Exhibit 10, the Definite Project Report, from the Army's description of Buggs Island operation.

Do you disagree with Mr. Cary's testimony that the flow assumed by the exhibit was taken from that report?

A I do not disagree.

Q Is there any reason for the assumption made in Exhibit 79, 80, 81 and 87 that the project must have enough water to operate as in Exhibit 74 in order to afford the full 91,000 kilowatts of capacity on the applicant's system load?

A There is no reason to make that assumption.

Q As a matter of fact, isn't it patent from the load curve given by Exhibit 29 and 92, and from the tables of capabilities, other capabilities of the applicant's generating plants, that the Roanoke Rapids project does not have to operate [R. 3521] with the flows assumed by Exhibit 74 in order to make the full 91,000 kilowatts capacity dependable on the applicant's system load in the peak week of December?

A They do not—the Roanoke Rapids project does not have to operate according to the assumptions in Exhibit 74, or the Exhibits 79, 80, 81 and 87, to make the project dependable on the VEPCO system to the amount of 91,000 kilowatts.

* * *

TESTIMONY OF JOSEPH J. A. JESSEL

[R. 613] DIRECT EXAMINATION.

BY MR. COSTELLO:

Q Will you please state your name and address for the record?

A Joseph J. A. Jessel. I reside in Falls Church, Virginia.

Q Will you state by whom you are employed and in what position?

A I am employed by the Federal Power Commission, Washington, D. C., as Principal Electrical Engineer. At the present time I am Chief of the Transmission Section and perform the duties of Assistant Chief, Division of Electric

Resources and Requirements, Bureau of Power, Federal Power Commission.

* * *

[R. 615] Q Mr. Jessel, was Exhibit 33 prepared by you?

A It was prepared by me.

Q What does the exhibit show?

A The exhibit presents the development of unit capacity value plus unit energy value of Roanoke Rapids project output based on the cost of like amounts of output from a privately financed steam-electric generating station.

Q Mr. Jessel, will you please state such unit capacity value in dollars per kilowatt year plus unit energy value in mills per kilowatt hours of Roanoke Rapids project output?

A $22.54 per kilowatt year is the unit capacity value and 3.79 mills per kilowatt hour is the unit energy value. These are not alternative values but rather they apply to the capacity and energy components respectively of Roanoke Rapids project output.

* * *

[R. 617] Q What analysis is generally made of the water supply at a particular site?

A We made the customary review and analysis in our study of the Roanoke Rapids project and it might be helpful if I explained the situation which we found as a result of our study.

As is customary, we reviewed the stream flow records at the site for as long a period as possible. These water supply records are set out in the U. S. Geological Survey Water Supply Papers to which you referred in Item B for reference in this hearing.

As explained by Mr. Sunda, we found that the period from April 25, 1930 to March 22, 1931, was the critical

period of flow and we used the record of flow during that period in arriving at the dependable capacity for the Roanoke Rapids plant. Since the Buggs Island reservoir will furnish the major water control, we also considered the operation of that [R. 618] project.

As a result of our studies we found that dependable capacity of the Roanoke Rapids plant would be in the neighborhood of 91,000 kilowatts. This same capacity was independently estimated by the applicant power company engineers and the United States Army Engineers. A similar study showed that the average annual output would be around 308 million kilowatt hours, as estimated by Mr. Sunda.

* * *

[R. 622] Q How would you classify the Buggs Island project hydro-electric generating station?

A I would classify the Buggs Island project generating station to be a peaking plant.

Q Dr. Jessel, what is your estimate of the annual load factor of municipal electric system loads?

A About 44 per cent, as may be computed from figures in column 14, lines 5, 6, 15, and 16 of Exhibit 34.

Q What is your estimate of the annual load factor of REA Cooperative system loads?

A About 42 per cent as may be computed from figures in column 14, lines 18 and 19.

Q Dr. Jessel, in view of the fact that the Buggs Island generating station would be a peaking plant, would it be adapted to serving some higher load factor municipal and REA Cooperatives system loads?

A Yes, sir, it could serve up to about 37,000 kw. and 120 million kilowatt hours of such loads during an adverse

water year, as shown by figures on lines 22 and 23 of Exhibit 34.

Q Assuming service to municipal and REA Cooperatives systems to the extent shown by figures on lines 22 and 23, Exhibit 34, how much Buggs Island project output would remain for disposal to other systems in the market area?

[R. 623] A 53,000 kilowatts of capacity and 105 million kilowatt hours during a most adverse year.

Q Dr. Jessel, would you please explain how you determined the amount of capacity and energy that would be supplied to large municipal systems having their own generating capacity, as shown by figures on lines 12 and 13?

A The amount of capacity and energy estimated to be delivered to large municipal systems in 1955 was based on carrying the peak portion of the load so as to realize the greatest amount of dependable capacity for the Buggs Island project, while at the same time preserving the full dependable capacity of municipally-owned fuel-electric generating facilities.

* * *

[R. 627] Q What would be the dependable capacity of the Roanoke Rapids project if its energy output were used exclusively to meet the entire needs of municipal and REA Cooperative system loads?

A About 48,000 kilowatts, assuming a reasonable distribution of water flow.

* * *

[R. 634] Q Based on your studies as summarized by Exhibits 35 and 38, if up to 10 per cent of the output of the Roanoke Rapids project were delivered to REA Cooperative systems at about 42 per cent load factor in a year of most adverse stream flow, in addition to that you estimated

from Buggs Island project, would there remain sufficient energy at the Roanoke Rapids project to make the remainder of the capacity at such project dependable on the 1955 load?

A No, sir, based on the study which I have made, all of [R. 635] remaining capacity of the Roanoke Rapids project would not be dependable on Virginia Electric and Power Company's estimated 1955 load.

Q If the United States were to market the Buggs Island and Roanoke Rapids project output, what proportion of such output could be delivered to REA and municipal systems, assuming the meeting of their full requirements?

A About 32,000 kilowatts from both projects if the remaining capacity is to be dependable on the large electric systems.

* * *

CROSS EXAMINATION

[R. 812] By Mr. Whitehead:

Q Is it not true that the schedule of release of water from Buggs Island will determine the point on the load curve at which Roanoke Rapids will operate?

A No, sir.

Q Why?

A Because the pond has sufficient daily regulation to permit utilization of the energy as desired by the Roanoke Rapids project on a peak.

Q For how long?

A For as long as required to make it dependable.

Q How long would it take to make it dependable?

A It varies from month to month.

Q What is the longest time required?

A At what load? I am not trying to be facetious; I am trying to say the hydro plant in performing its proper function in serving loads, on the peak of the load it takes its hourly variations, [R. 813] and sometime during that interval it takes the full rating of 91,000 kw.

Q Doctor, its ability to meet the peak load demand depends on its capacity.

A I have an estimate of that.

Q Then I want to ask you what is the longest period of time that peak load does continue on the Virginia Electric and Power Company system.

A When? We had 12 peak loads in the year.

Q The highest peak.

A That occurs in December, the highest peak load. I have that information right here. In December, 1955. The peak load of 820,000 kilowatts only occurs for one hour. The next highest on each side is 738,000 and 746,000.

Q That is for one hour?

A Three hours.

Q I beg your pardon?

A Three hours—the preceding hour, the peak, and the hour following.

Q Now, will the pondage provided by the dam at Roanoke Rapids maintain that peak load for three hours?

A As I have indicated, it is more than ample. In fact, as I figured, I assumed the maintenance of daily peak for 22 or 23 days continuing all the time, as a factor of safety. It only occurs once a month. In my computations I assumed [R. 814] it would happen 23 times in December to check out the availability of the pond to do it.

Q So there will be no question about it, I want to ask it again: Will the pondage at the proposed plant of the Virginia Electric & Power Company at Roanoke Rapids be sufficient to provide this peak load for three-hour period?

A Yes, more than adequate.

Q More than adequate?

A Yes, sir.

Q Of course, you are assuming now that Buggs Island is not in the meantime discharging any large amounts of water.

A That is correct.

* * *

[R. 816] Q I will ask you this: If it should appear in evidence that the demand of Virginia and North Carolina cooperatives alone, that is the combined demand of the two, as of 1955 will be 98,000 kw, and the estimated consumption will be 374 million kilowatt hours, how does that fit into the picture you have presented?

A The picture I presented indicates that the full output of Buggs Island project, if supported, with steam-electric capacity could supply a load of 134,000 kilowatts, which is larger than you mentioned so that Buggs Island is still adequate to supply all of that. * * *

* * *

[R. 818] Q Doctor, in view of the fact that Roanoke Rapids is in House Document 650, which also includes Buggs Island, do you not think you should have made a study showing a relationship of the two with the application contemplating withdrawing Roanoke Rapids from that comprehensive plan?

A I am glad you said "comprehensive plan". I also work with the River Basin Division; I have sort of a roaming job. In a comprehensive plan, as such, the essential point is to

make sure that the power sites are properly protected so they can be developed when economical. The installation, the hydraulic capacity, the design, is a matter of detail which is taken up as each project comes up, as in the case of Buggs Island, but the basic concept is to protect the power sites on an overall basis. That is the basic point, with [R. 819] variations. It is a question of time when you need the project and as to w t time the project comes up, those matters will be taken up when the project is authorized.

* * *

[R. 830] Q Is it not a fact that the peaking demands of the Virginia co-ops alone, or the Virginia co-ops together with the North Carolina co-ops, assuming other power sources, would call for 50 or 55 or 60 thousand kw. from Buggs Island? Could they get it or not?

A That would depend upon the Department of the Interior.

Q Is it feasible under the study that you made?

A If they are to get all of their requirements, I think the Secretary of the Interior would have a little difficult job explaining what is to be done with the rest [R. 831] of the capacity at Buggs Island.

Q If you take Roanoke Rapids and Buggs Island and put them together, and the co-ops' demand for peaking purposes were 50 or 55 or 60 kw., would that be available or not?

A If the co-ops could not provide any of their own stand-by capacity, it would depend, again, upon the Secretary of the Interior. If such amounts are supplied to meet the entire requirements, then there would remain capacity at the projects with insufficient energy to make them dependable on near-by systems.

* * *

[R. 861] By Mr. Gatchell:

Q Doctor, do your power market studies indicate the construction of the Roanoke Rapids project should be undertaken in the immediate future for the general power market?

A Yes, sir, they do.

* * *

[R. 1876] Q How is the annual dependable capacity of hydro-electric plants determined?

A As set out in F.P.C. Form No. 12 of the Commission's forms, this being a power system statement filed by electric utilities and licensees throughout the United States, the annual dependable capacity is determined by the difference between the annual peak load and the maximum other capacity required, as shown by the sketch on page 7, F.P.C. Form No. 12, on Schedule 2.

Q Are these practices in accord with general utility practices?

A They are. It has been my experience that these principles were not originally formulated by the Commission, but were taken from utility practice which had been built up from years of experience. This method of presentation of this definition first appears on F.P.C. Form 11-127, a predecessor to Form No. 12, covering electric utility operations during the calendar years 1934 through 1936.

Q Should a condition such as freezing for a short period occur in the Roanoke River basin, would that be considered as [R. 1877] affecting the determination of dependable capacity for the Roanoke Rapids plant?

A An examination of the water supply records for this area as testified to by Mr. Sunda, shows that freezing of the river is of infrequent occurrence. In F.P.C. Form No. 12, on

page 7, Schedule 2, there is provided, "Where stream flow records indicate that the most adverse flows are not likely to occur except at long intervals of time and are likely to be of a very short duration, the figures used in determining the capacity and energy available from hydro plants may be modified, treating such abnormal limitations as emergency conditions to be covered by reserve capacity. Such modifications, however, should be fully explained."

In view of this, freezing in the Roanoke Basin should not enter in the determination of dependable capacity.

Q. You were reading an exact quotation from F.P.C. Form No. 12?

A I was in that case, just to make sure I had no errors of transcription.

Q What factors are considered in determining dependable capacity as related to a hydro-electric project?

A The factors considered in determining dependable hydro-electric capacity include the following:

Time of occurrence and magnitude of the annual system peak; the distribution and characteristics of the monthly peak loads; [R. 1878] load curve data; provisions for necessary maintenance scheduling; reserve capacity to be supplied by own system; contracts for purchase or interchange of off-peak energy; limitations of thermal electric plants as determined by load shapes, and temperature of cooling water; and hydro-electric capacity and energy available during the period of most adverse stream flow so controlled as to yield the maximum dependable hydro-electric capacity value.

* * *

[R. 1880] Q From the studies which you have made, do you agree with the statement of the witness, Mr. Hamilton, that the Roanoke Rapids project would not be depend-

able to the full amount of 91,000 kilowatts if Buggs Island were never constructed?

A I do not. My studies show the Roanoke Rapids project would be dependable to the full extent of 91,000 kilowatts on the Virginia Electric and Power Company load, based on natural flows. This takes into account the suggested condition in Exhibit 8 which, as I understand, is not equivalent to a requirement, but a factor which may require consideration in the future.

* * *

[R. 1885] Q Are you in agreement with the engineering testimony presented on behalf of the Secretary of the Interior with respect to the benefits which will be conferred by the Buggs Island reservoir upon the Roanoke Rapids project, and if your answer is in the negative, will you give us the reason, please?

A I do not agree. As I have stated previously, the Roanoke Rapids project would have dependable capacity to the full extent of 91,000 kilowatts, even if the Buggs Island Reservoir were never constructed. Therefore, that reservoir cannot add to the dependable capacity of the Roanoke Rapids project. This appears to have not had sufficient attention from the witness for the Secretary of the Interior.

* * *

[R. 1891] Q Did you hear Mr. Hamilton present his testimony as [R. 1892] how he derived the headwater benefit of $690,000 which he considered and which appears also on Exhibit 48?

A Yes, sir.

Q Do you consider the estimate as given by him to have a reasonable basis, considering all of the factors which have a bearing upon such a matter?

A In my opinion there is no factual basis for considera-

tion of this figure as reflecting anything like the actual benefits to be obtained by the Roanoke Rapids project by reason of the operation of the Buggs Island reservoir. He excluded the three types of annual benefits mentioned in the Army Engineers' letter, Exhibit 9, namely, land enhancement, fish and wildlife, and land rental and timber sales.

He did not consider adequately the functions performed by the portion of the Buggs Island reservoir allocable to power. He did not consider the values received by storing in and releasing water from the Buggs Island reservoir during off-peak and on-peak hours; the availability of Roanoke Rapids pond to store the water released from storage during off-peak hours, nor the other factors which have been referred to by me in connection with the matter of headwater benefits.

* * *

[R. 3000] Q How much energy would be required to make the Roanoke Rapids project dependable in the amount of 96,000 kilowatts on the Virginia Electric and Power Company's system during the peak week of December, 1953?

A 909,000 kilowatt hours. This energy, however, does not include the energy for minimum releases which are not on peak hours.

Q What is the relation, if any, in your opinion, between Exhibits 61 and 74?

A The two exhibits have no relation, in my opinion, except that Exhibit 61 represents the 96,000 kilowatt section from the system peak of Virginia Electric and Power Company for December, 1953, and Exhibit 74 represents a 96,000 kilowatt [R. 3001] block-load section at a lower position in the same load curve.

Q Have you examined the monthly peak load character-

istics of the Virginia Electric and Power Company system loads?

A Yes, I have.

Q Are you suggesting that the Roanoke Rapids plant would have capacity value to the Virginia Electric and Power Company system for only two or three hours out of the year or during only a single week out of the year?

A No, sir, I am not. My exhibits and testimony in the record show that the project was found to be dependable based on a month by month study of the VEPCO loads and energy supply during the most adverse water flow period.

* * *

[R. 3002] Q How would you determine where on the Virginia Electric and Power Company system load the output of the Roanoke Rapids project would be used, assuming an average daily flow as shown in column (c)?

A I would refer to the weekly load curve for the month in question and so place the plant on the load as to make possible the realization of the maximum output of 96,000 kilowatts from the project, including the existing plant, with the energy that would be available from such releases as shown in column (c) on Exhibit 79, namely, 4310 cfs.

Q Is this customary utility practice for the best utilization of hydro-electric plants in systems also having steam generating capacity, or is this an unusual or extraordinary practice?

A. It is customary and not unusual in determining the position on the load of any hydro-electric plant.

* * *

[The following from pages 3347-3352 of the record is printed to clarify the portion of the record given inadequately in Petitioners' Appendix at page 924.]

[R. 3347] By Mr. Hankin:

Q Now, after stating on page 3004 that the figures in column (s) [of Mr. Hamilton's Exhibit 79] according to your method, would not be zero, you further state that this does not mean that the Roanoke Project would not have a dependable capacity for the full amount of 91,000 kw for the reason that Exhibit 74 is not the proper exhibit to determine the dependable capacity of the Roanoke Rapids project on the November load.

Does it not follow that, operating the project under the pattern as shown on Exhibit 74, you do not get the full capacity of 91,000 kw?

A Assuming that such an operation was required I think it is fairly obvious.

Q And in accordance with the testimony given by Mr. Cary on page 2287, it was assumed that such an operation was required.

Mr. Gibson: I have to object to counsel's misstatement of the record.

The Witness: May I finish my answer?

Chief Presiding Examiner: Yes.

The Witness: That was only based on the assumption of [R. 3348] certain flows being available, and certain coordination between Buggs Island and Roanoke Rapids. Obviously you have to operate so as to not spill water.

By Mr. Hankin:

Q Well, isn't that the purpose and effect of Exhibit 79; to show that with that amount of water as shown on there, you can't obtain the dependable capacity of 91,000 kw?

* * *

[R. 3349] A My trouble arises that, even with those assumptions, I don't agree on the figures in columns (c) and (g) [of Exhibit 79]. I can't respond, because the use of water [in Exhibit 79] isn't the best that can be made, even in the assumptions in Exhibit 74.

* * *

[R. 3351] Q In other words, what he [Mr. Hamilton] testified to is that in the critical low flow period, with the assumptions made in the left-hand side of that exhibit [Exhibit 79], you simply don't have enough water to operate in accordance with Exhibit 74; isn't that so?

A He also said that even—he also assumed the [R. 3352] required release in column (1) [of Exhibit 79], which would make possible such operation, and then on cross, as I remember—the record will show what he said—that even there he didn't have enough water to do what would be required for the purpose of the exhibit [Exhibit 79].

Q Oh: no doubt.

A Then the whole exhibit [Exhibit 79] in my understanding has no meaning at all, because you are working with conditions which are not practical.

* * *

[R. 3403] Q 35 and 38 show that the project is dependable for 91,000 kw during these periods?

A During the whole year here in this case; dependable on the load, on an annual basis.

Q How do those exhibits show that that is dependable? In that exhibit aren't you merely putting down dependable [R. 3304] capacity, so many kilowatts, or do you think that these exhibits show or demonstrate that there is a dependable capacity of 91,000 kilowatts?

A These exhibits show energy and capacity, both. For

example, Exhibit 35, line 6, dependable capacity—I am sorry, that is line 15, capacity, line 16, energy going with it.

[R. 3405] Q Yes, now you merely put down those figures, but do these exhibits show that the project will have that capacity?

A These exhibits are based on load curve studies, as I have explained when I introduced these, and that is what the results show.

* * *

[R. 3412] THE WITNESS: Exhibit 92 only shows the requirement for one hour. It doesn't show supply. It shows no information on supply at all, as I understand it, it is requirement.

* * *

[R. 3431] Q Now, in your month by month study that you made reference to in answer to a question by Mr. Hankin a few moments ago, you made reference to requirement of capacity with respect to the Roanoke Rapids plant.

What did you mean by this 4 percent figure? We are not sure. Did you mean that the 91,000 kw. at Roanoke Rapids was required by the load for only four percent of the time, or that such a capacity is available only four percent of the time?

A Required 4 percent of the time by the load shapes I used for '55, which were probably different from those in Exhibit 29.

* * *

TESTIMONY OF THOMAS H. WIGGLESWORTH

[R. 1301] CROSS EXAMINATION

BY MR. GATCHELL:

Q Mr. Wigglesworth, as I understand your testimony, it is your opinion that the Roanoke Rapids project, as pro-

posed in House Document No. 650, is economically feasible for development at the present time?

* * *

[R. 1302] THE WITNESS: I haven't made any studies which would show whether it is or not.

* * *

[R. 1320] Q Then, as I understand it, you yourself have made no study of the Roanoke Rapids project as proposed in House Document 650 to determine whether it would be economically feasible at the present time?

[R. 1321] A I have not.

* * *

DIRECT EXAMINATION

[R. 1407] BY MR. HANKIN:

Q Yesterday, on pages 1301, 1311, 1312, 1314, and 1320, Mr. Wigglesworth, you were asked various questions concerning the feasibility of the Roanoke Rapids project in House Document 650 and you answered that you had not made any study of the feasibility of this project under the present costs. After the adjournment I asked you to make such a study of both Roanoke Rapids project in House Document 650 and in Plan D, Exhibit 11. Have you made such a study?

A Yes, I have made such a study now.

* * *

CROSS EXAMINATION

[R. 1411] Q Have you made any study of the economic feasibility of either Plan D as set out in Exhibit 11, or the Roanoke Rapids project, as proposed in House Document 650 under private financing?

A I have not.

* * *

[R. 1412] Q In your opinion, which of the three plans would call for a project that would be best adapted to the

comprehensive development of this region, Project 2009, Plan D, as in Exhibit 11, or the Roanoke Rapids Project as proposed in House Document 650?

A I haven't reached any—

MR. HANKIN: I would like to raise this question: Does [R. 1413] counsel mean under private construction, or by the government?

BY MR. GATCHELL:

Q Either way, Mr. Wigglesworth?

A I haven't reached any conclusion as to which would be the best..

* * *

[R. 1418] BY MR. COHN:

Q Mr. Wigglesworth, do you have Exhibit 45 before you?

A Yes, I do.

Q I notice that in Exhibit 45 the annual charges given for Plan D, Exhibit 11, are in the amount of $4,799,000, is that right?

A That is the annual charge as taken from Exhibit 11.

Q You will notice that in the document marked Exhibit 54, for identification, under Plan D, Exhibit 11, the total yearly costs are given as $1,739,000. Is that right?

A That is correct.

Q Would you tell me what causes the variance in those two figures? I take it they are intended to represent the same item, are they not?

A Yes.

MR. HANKIN: I think that is clear from the exhibit. There is no need for further questioning.

MR. COHN: Mr. Examiner, it certainly is not clear to me.

CHIEF PRESIDING EXAMINER: You may answer the question. Objection overruled.

THE WITNESS: It is the difference between private financ- [R. 1419] ing and government financing, as I understand it.

* * *

TESTIMONY OF GEORGE W. HAMILTON

[R. 975] DIRECT EXAMINATION

BY MR. HANKIN:

Q Will you please give your full name and present occupation?

A George W. Hamilton. I am a consulting engineer.

* * *

[R. 996] A * * * [R. 997] Since the storage at Buggs Island will be utilized to practically the same extent by both Roanoke Rapids and Buggs Island, the least measure of evaluating the downstream benefits to Roanoke Rapids resulting from storage water at Buggs Island would be to divide the cost of storage equally between the two projects.

* * *

CROSS EXAMINATION

[R. 1133] BY MR. MOORE:

Q Will you now turn over to a chart in the Charles T. Main report entitled, "Integrated Kwh hours versus Kw for top Kw of load duration curve, dated June, 1953." Do you find that?

A Yes.

* * *

[R. 1138] Q Are the kilowatt hours indicated on that chart anywhere near as many as called for in your hypothetical study shown on your Exhibit No. 51, for 16 hours' operation?

* * *

THE WITNESS: These kilowatt hours are much lower than as shown on that exhibit.

* * *

[R. 1174] Q Mr. Hamilton, do you mean to state that the charge from apportioning Buggs Island storage cost would or should, in any case, exceed whatever is the actual benefit to Roanoke Rapids?

CHIEF PRESIDING EXAMINER: He asked you if you meant to say that.

THE WITNESS: Yes, I meant to say that.

* * *

[R. 1190] Q I asked you if you assumed that the Army Engineers or the United States could build the Roanoke Rapids project more cheaply than Virginia Electric and Power.

A No, I did not assume that.

* * *

[R. 1194] BY MR. GATCHELL:

Q If the Buggs Island project has varied and the cost to benefits ratio for that project has varied, then the cost to benefits ratios that you read from pages 7 and 8 of House Document number 650 are no longer applicable, are they?

A The proportion may be applicable. All I did was state what the change would be in ratio if under the House Document Roanoke Rapids was dropped out.

Q I am just asking you if those ratios as relating to the Buggs Island project are any longer applicable?

A No.

* * *

[R. 1220] BY MR. GATCHELL:

Q Mr. Hamilton, as I understood you yesterday, you had

made no load studies of the Virginia Electric and Power Company system operations.

A That is correct.

Q You have made no monthly load studies, no weekly load studies, or daily load studies?

A Only in the studies that appear in the report of the Charles T. Main Engineering Company.

Q All right, now, what are those, are they monthly?

A Monthly.

Q They are all monthly, are they not?

A Yes, sir.

Q So that you do not know how the Roanoke Rapids plant could be operated on the load of the Virginia Electric and Power Company system, so far as its weekly or daily operation is concerned, do you?

A I do not know how they would operate it, nor do I believe they know how they would operate it in the years to come.

Q But you have not made any load studies to determine how it would fit into the present load pattern, have you?

[R. 1221] A No, I have not.

Q And that includes load studies hour by hour?

A No.

* * *

[R. 1239] By Mr. Gatchell:

Q No, I am afraid that is not my question. My question is very simple.

[R. 1240] Would you consider the Roanoke Rapids project dependable on an annual system basis to the full extent of 91,000 kilowatts if during one month of the year no flow

came into the reservoir, but the system peak during that month was 100,000 kilowatts less than the annual system peak load, and the hydro plant was not needed during that month?

A To that specific question, the answer is yes.

* * *

[R. 1252] Q Now, how far down is it that you assume the dead storage may be drawn?

A I did not make any assumption as to how far it could be drawn. I did consider that emergency water could be pulled out of that dead storage.

Q You have no idea as to how much it would be drawn down. Do you have any idea as to how much the volume of water taken from dead storage would be?

A No, I haven't.

Q Would it be used from dead storage through the Buggs Island plant, in your assumption?

A Yes, it would be. As long as we had ample coverage over the intakes we could use that storage.

Q How much is that coverage?

A I didn't check on that.

Q You mean you didn't know how much they could draw it down?

A I haven't seen the design, so I do not know.

Q Do you not know where the penstock opening is to be located?

A No, sir.

* * *

[R. 1255] Q Is it necessary to know what those hours are in order to answer this question? When it is operating

on-peak at Buggs Island would that water have full capacity and energy value at Buggs Island?

A For that particular time when it is operating, it would.

Q Certainly. Now, would most of the water released [R. 1256] during on-peak hours at Buggs Island reach the Roanoke Rapids project during what you would regard as the on-peak or off-peak hours at Roanoke Rapids?

A It would reach there about eight hours later.

* * *

[R. 1279] By Mr. Rouse:

Q Mr. Hamilton, if you will turn to page 1000, please, the sentence beginning in line 14, you stated, on direct examination that, "The United States should be reimbursed for the Buggs Island project in the amount of $3,762,000 per year."

A Yes, sir. No. Just a minute. Yes, sir.

Q Now, do I understand that that figure of $3,762,000 is the same figure shown on Exhibit 9 as the annual benefit of power at site, at Buggs Island?

A Yes, that is the same figure.

Q That represents, does it not, an average charge for the 410 million kilowatt hours of something in excess of 9 mills?

A That represents the amount the government believes they will have to collect in order to get a proper ratio of benefits to cost in their securing the authorization of the project.

Q If you divide 410 million into that figure, what does it give you?

A It would give us a little over 9 mills, about 9 mills.

* * *

DIRECT EXAMINATION

[R. 1297] Q Lines 4 through 7, there was a question. The question was:

"Mr. Hamilton, do you mean to state that the charge from apportioning Buggs Island storage cost would or should, in any case, exceed whatever is the actual benefit to Roanoke Rapids?"

And your answer to that question was, "Yes."

Would you please explain your answer?

A I think the answer is wrong. I do not think that Roanoke Rapids should be charged for benefits they don't get.

* * *

CROSS EXAMINATION

[R. 2886] By Mr. Moore:

Q Mr. Hamilton, are not all of those exhibits of yours, 79, 80, 81 and 82 based on your assumption that in order to be dependable on the load of the applicant, Virginia Electric and Power Company, for its full capacity of 91,000 kw, the Roanoke Rapids Project must operate as indicated on that Exhibit 74?

A Well, it is my understanding that that is what Mr. Cary testified to and that is the proposed schedule which they would like to operate under.

Q The answer to my question is yes, isn't it?

A Yes.

* * *

[R. 2889] Q You do understand, do you not, that Exhibit 61 affords the measure of energy necessary for the project to carry the company's system load above 624 megawatts in the week of annual peak load in December, 1953?

A What was your question?

MR. GIBSON: Will the reporter read it back?

(The record was repeated by the reporter.)

THE WITNESS: I don't know whether that will do that, or not. [R. 2890] It set forth that it would do that.

BY MR. GIBSON:

Q Is there anything in your Exhibits 79, 80 and 81 showing that it would not do that?

A No. If you have full storage it is possible to so regulate the storage with the natural releases that you would get possibly 96,000 kilowatts for one hour on each of the days in December. However, to my mind no one would wish to spend $27,000,000 to get four hours of capacity in the month of December.

Q I understand that. I have heard your views but you gave me quite an explanation in answer to a question which was a question calling for a yes or no answer.

MR. HANKIN: Are you asking for a yes or no answer on that?

CHIEF PRESIDING EXAMINER: Let us have order.

MR. GIBSON: I have asked a question which calls for a yes or no answer and I would like to have either yes or no as an answer.

THE WITNESS: Will you read the question, please?

* * * *

[R. 2891] THE WITNESS: I cannot make a positive statement until I study these exhibits to see if there would be enough water on certain days, as covered by these exhibits, to permit of meeting the load pattern on 61.

* * *

[R. 2892] CHIEF PRESIDING EXAMINER: Can you answer it with your present knowledge and information?

THE WITNESS: No, I cannot.

MR. GIBSON: That is satisfactory to me, sir. That's all.

* * *

[R. 2893] THE WITNESS: Mr. Examiner, I have made a couple of checks on that last answer that I could change, if you want me to.

CHIEF PRESIDING EXAMINER: Mr. Hamilton states he would like to make a slightly different answer to the question asked just before the recess. He has checked certain matters and desires to amend his answer. I shall permit him to do so. Will you go ahead and state it.

THE WITNESS: On Exhibit 80 there are a number of days in there where we do not have sufficient storage and second feet flow to equal 2625 second feet days that would be required to meet the pattern. That is also true on Exhibit 81. There are a number of days beginning with the 26th, 27th.

BY MR. GIBSON:

Q But the exhibits or your exhibits do not compute whether the pondage at Roanoke Rapids can be used to take care [R. 2894] of those days for purposes of Exhibit 61, do they?

A No. The exhibit shows how we would operate to conform to the pattern.

Q Of Exhibit 74?

A Of Exhibit 74, one conforming to the pattern and the other without any attempt to conform to the pattern.

MR. GIBSON: That is all, thank you.

* * *

[R. 2917] Q In looking at column (a) on this exhibit would the load of the Virginia Electric and Power Company have characteristics such as would permit utilization of the average power shown in column (i), for five hours a day, or less, five days a week?

A This exhibit doesn't apply to any load pattern other than load pattern 74.

Q All right, I understand that. That is the way you have prepared it. I am asking you if the load pattern of Virginia Electric and Power Company would have characteristics which would permit utilization of the average power which you have shown on exhibit 79 in column (i), for five hours a day, five days a week?

A I don't get your question.

MR. GATCHELL: May the question be read to him?

CHIEF PRESIDING EXAMINER: The reporter will read the question.

(The record was repeated by the reporter.)

MR. HANKIN: Do you understand the question, Mr. Hamilton?

THE WITNESS: I wouldn't know unless I analyzed it and had all the load curves before me.

BY MR. GATCHELL:

Q Did you have any basis for assuming, for the purpose of column (j), that the Roanoke Rapids Project would have to operate 16 hours a day on weekdays and 6 hours on Saturday, [R. 2918] other than Exhibit 74?

A No. This is based on Exhibit 74.

* * *

TESTIMONY OF WALTON SEYMOUR

[R. 1007] DIRECT EXAMINATION

BY MR. HANKIN:

Q Will you state your name and your position with the Department of the Interior?

A My name is Walton Seymour; I occupy the position of Director of the Division of Power in the Office of the Secretary of the Interior.

* * *

CROSS EXAMINATION

[R. 1516] A Our plans contemplate that as the marketing work develops it will finally be consummated in the form of firm contractual commitments with the purchasers of power from these projects.

Q And there have been no such commitments to date?

A Right.

* * *

[R. 1517] Q You speak of the region to be served or to be supplied. What do you consider the economic transmission distance?

A Well, that question is a little bit difficult to answer because it depends on many factors. The economic transmission distance in theory from any source of supply I would define as the distance from the source, at which it is economical to supply a given load.

Q Have you made an application of that specifically to [R. 1518] the region within economic transmission distance of the Buggs Island project?

A No, sir.

* * *

[R. 1519] Q How long after completion of construction do you estimate it will take before your load from the Buggs Island project will be completely absorbed in the market.

A You mean the capacity of the Buggs Island project?

Q The capacity, yes.

A On the basis of the indications to date from our examination of the markets, I would hope that as soon as the Buggs Island project is completed its entire capacity can be made fully effective as a part of the power supply in the region.

Q Then that would include the sale of some energy to the large public utility systems in that area?

A I think that that is probable.

* * *

[R. 1520] Q I understood, Mr. Seymour, that in your contemplation there can be no further privately owned power plants constructed in the Roanoke River Basin; is that correct?

A I certainly wouldn't say that, because the Roanoke River Basin is a pretty big geographical area.

Q Certainly not at any of the sites set out in House Document 650?

A You said "power plants", and that is a pretty broad category.

Q I mean hydro-electric power plants.

A I would say that we would urge that the government [R. 1521] develop directly all the projects contemplated in the comprehensive plan of development for the Roanoke River Basin, as recommended by the Corps of Engineers, concurred in by the Federal Power Commission and ap-

proved by the Congress in House Document 650, with such modification as may develop as the project moves forward.

I am not at all clear that that completely eliminates the possibility anywhere in the Roanoke River Basin of any other developments.

Q Do you know of any other sites in the Roanoke River Basin that are suitable for hydro-electric power development, other than those mentioned in House Document 650?

A Particular sites, no, sir.

* * *

[R. 1523-24] Q Have you made any recommendation to Congress with respect to development of the Roanoke Rapids Project by the United States?

A Not that I know of, sir.

* * *

[R. 1538] By Mr. Gatchell:

Q I am afraid I have not made myself clear, Mr. Seymour. I am not trying to suggest that the rates would be exactly equal to those elements of cost, but what I am trying to ascertain is whether, in your opinion, your responsibilities call for the fixing of rates which, in themselves, will bear a part of the cost of flood control at the Buggs Island project.

A Our responsibilities require us to give consideration to a part, to the proportion of the costs of the common facilities used for flood control, power and other purposes which might be allocable to power.

Q We have agreed upon that. Does that mean that you have by that process excluded any part of the cost of flood [R. 1539] control?

* * *

THE WITNESS: There would be some costs of flood control which would certainly not be considered as a cost of power in determining rates.

MR. GATCHELL: Thank you.

* * *

[R. 1547.] CHIEF PRESIDING EXAMINER: Your objection to the plan of [R. 1548] the power company for Roanoke Rapids does not go to the efficiency of the plant, from an engineering standpoint?

THE WITNESS: No, sir.

* * *

[R. 1561] Q As I understand it, except for those within fairly close range to Buggs Island about which you spoke a moment ago, the answer to my question as to whether or not power could be delivered economically to any particular cooperative listed in this Exhibit 43, would depend upon a study of the facts as to the particular case, would it not?

A One would have to look more closely as the distance increased, yes, sir.

Q Could you take this exhibit and of your own knowledge [R. 1562] list for us those that you know power could be economically delivered to from Buggs Island at reasonable transmission distance?

A It would take a pretty extensive study, sir. I wouldn't want to do it off-the-cuff.

Q You have not that knowledge now, as I understand it?

A Right.

Q As a general rule, have you in mind any fairly clear rule-of-thumb, I will call it, within which it is your judgment that power may be economically delivered from Buggs Island to a cooperative?

A That is the kind of a rule-of-thumb which is a mighty risky one. I haven't one, and I would look askance at one if it was handed me, because it is a pretty complicated problem.

* * *

[R. 1567] BY MR. MOORE:

Q If you will look at Exhibit 43, in the light of the answers you have just given, I want you to state whether or not, addressing yourself now to that particular group of cooperatives in Mr. Wickard's letter, whether or not you conceive it to be the duty and responsibility of your department to build all transmission lines required, and to furnish the power from Buggs Island to all those cooperatives, although they are spread out all over the State of North Carolina and a very considerable part of Virginia, even though that power may be sold at a price which will pay all the operating expenses and necessary carrying charges at the project.

A The responsibilities of the Department in that [R. 1568] direction will be determined only when we have contracts which will indicate where we are going to have to deliver the power, and when we know whether building transmission lines by the government is the most economical way to do the job.

Q So that you cannot say now that you consider that is your duty or responsibility, to supply the power and build all necessary transmission lines for delivery of the required or desired power by all that group of cooperatives shown on that exhibit, can you, at this time?

MR. HANKIN: That is not what the witness said, your Honor, and I don't want counsel to put words into his mouth.

MR. MOORE: Your Honor—

CHIEF PRESIDING EXAMINER: Just a moment. Can you respond to that?

MR. MOORE: I think it is a perfectly simple question.

CHIEF PRESIDING EXAMINER: I think he has answered you substantially.

MR. MOORE: He has not quite answered that direct question.

CHIEF PRESIDING EXAMINER: If he wants to add something else—you heard the question, Mr. Witness.

MR. MOORE: May the question be read back to him, if he does not have it clear in mind. The witness is a very intelligent witness, despite the objections of his counsel.

CHIEF PRESIDING EXAMINER: I agree with counsel fully about [R. 1569] that. Do you understand the question or would you like to have it read back?

THE WITNESS: I would like to have it read it back, Mr. Examiner.

CHIEF PRESIDING EXAMINER: Read the question, Mr. Reporter.

(Question read.)

THE WITNESS: I cannot say it is the responsibility of the Secretary to deliver power to any particular group of customers now, because no commitments have been made to any particular group of customers.

On the other hand, if these cooperatives ended up as the preferred agencies to which the output of these projects should in fact go, because of the priority of their application or otherwise, they might get the power from these projects, and I cannot, therefore, say that it is not our responsibility to deliver it to them.

* * *

[R. 1577]. By Mr. Moore:

Q Now, if it appeared, say next week, that an application were filed by Virginia Electric and Power or Appalachian Electric Power or Carolina Power and Light or Duke Power for the development of the Schoolfield project where the ratio appears to be .84—that is minus—as I understand your testimony of a moment ago you would feel it likewise to be your duty to intervene in that proceeding and oppose the granting of a license for such construction?

Mr. Hankin: That is argument.

Chief Presiding Examiner: Did you say that?

The Witness: That is not what I said.

[R. 1578] By Mr. Moore:

Q I asked you, did you mean that?

Chief Presiding Examiner: Answer that if you can.

The Witness: I think we would want to study the whole facts before we took a position of that kind, in order that we could be sure of our position. As of the present time I don't know all of the related facts which ought also to be considered, besides those which you just cited.

* * *

[R. 1592] Q This will get at what I am trying to obtain: Do you conceive it to be your duty to undertake to sell the power at a price that will amortize not only the portion of the cost that is allocated to power, but also the portion that is allocated to flood control and other benefits?

Chief Presiding Examiner: Do you consider it your duty, is the way that question started.

Mr. Moore: That is right, sir.

Mr. Hankin: Or would you like to consult a solicitor?

MR. MOORE: We don't need a solicitor for that. He is [R. 1593] the one who determines what he is going to try to sell it for.

CHIEF PRESIDING EXAMINER: Can you answer that question the way it was asked?

THE WITNESS: It is difficult to answer, sir, because he inadvertently, I am sure, has departed from the requirements of the law.

CHIEF PRESIDING EXAMINER: You see, you take his question as a whole. It seems to me that you might answer it. I leave it to you, taking it as a whole. If it is not correct in all its parts, the answer would be one thing. But you answer the question as a whole, and it seems to call for a categorical answer which, when it is considered as a whole, can be made, it appears to me.

THE WITNESS: Not exactly, sir. The conception that I have of the responsibility of our Department is to determine rates for the sale of power from these projects, with due regard for the costs allocable to power, and those costs may well include part of the cost of common facilities that are used for flood control, power, and other purposes, and having regard also for the balance of the directives in the law, that we sell the power on a basis which will encourage its widespread use, that we sell it on a basis which will permit the lowest possible rates consistent with sound business principles, and that we give preference in its sale to public bodies and cooperatives.

[R. 1594] BY MR. MOORE:

Q Let me direct your attention to Mr. Hamilton's Exhibit No. 52, and this, I think, will enable us to shorten this matter. You notice that according to his method of allocating investment of the government between power, flood control,

and other things, he makes a determination on Exhibit 52 of $14,680,000 allocated to flood control. He allocated another figure representing power. My question is simply aimed at obtaining from you whether or not you propose to sell the Buggs Island power at rates which will be intended to return to the government through amortization the flood control portion, and any other parts of the investment, other than power, as well as power.

A This allocation estimate which Mr. Hamilton included on this exhibit does not necessarily mean to cover all of the costs of flood control. It is his estimate of the amount of the total cost of the project which, when related to flood control benefits, might be allocated to flood control.

Q You haven't answered my question. Do you propose to set rates, if possible, at schedules which will return to the government through amortization, the entire investment, including not only the power portion, but also the flood control part of the investment, and any other parts of the investment except power? In other words, do you propose to return to the government through the sale of power the government's entire [R. 1595] investment in Buggs Island? The answer to that is either yes or no, do you or not?

A The law does not require it, sir.

MR. MOORE: Your Honor, will you require the witness to answer my question?

CHIEF PRESIDING EXAMINER: Yes, I direct you to answer. You heard the question.

THE WITNESS: We have no present intention of that kind, because the law does not require it. But that does not mean that as an actual matter of accounting the revenues from the project, over its life, may not actually accomplish what you are talking about.

BY MR. MOORE:

Q But that would not be your intention, if you maintain your present program, would it?

* * *

THE WITNESS: I will have to answer that, sir, not [R. 1596] necessarily.

BY MR. MOORE:

Q How do you propose that the government will be reimbursed for the part of this Buggs Island investment that is allocated to flood control and other benefits?

A I am not proposing that the government be reimbursed for the part of these projects which is actually devoted to flood control and which is not allocated to power.

* * *

[R. 1597] Q But you do know what, so far as you are concerned, is your intention, and I am asking you whether or not it is your intention to charge rates that will be intended to return to the government only the power portion of the investment, or do you intend to set rates that will return the entire investment?

* * *

[R. 1598] THE WITNESS: Mr. Examiner, the only way I can answer it and feel comfortable, that I have actually expressed my opinion in response to Mr. Moore's question, is to say, not exactly.

* * *

[R. 1619] Q Is it your view that the prices at which power from the Roanoke River Basin pool would be sold, would or would not be sufficient to yield the power benefits estimated for those projects by the Corps of Engineers?

A I think that the benefits in all cases exceed the costs. We are not directed by law to give regard to the benefits,

but we are directed to give regard to the costs and therefore the benefits would not determine the rates at which the power is sold.

Q Is it your view that the prices at which power from the Roanoke River Basin pool would be sold, would or would not be sufficient for to yield the power benefits?

A The power benefits will be yielded regardless of the price at which power is sold from the Roanoke Rapids project, as long as the price at which the power is sold is equal to or less than the benefits, because the benefits are those that accrue to the consumers of power in the basin.

Q You consider the power benefits as listed by the [R. 1620] Corps of Engineers to be equivalent to the benefits that may be attributed either to consumers or to the United States Government?

A The benefits represent the value of the power.

Q Measured on what basis?

A Measured on the basis used by the Corps of Engineers.

Q What is that basis?

A I don't have it before me.

Q Are you not aware of the general measure used to estimate the value of power at those sites?

A Oh, yes, sir.

Q What is that general measure?

A Generally the Federal Power Commission and the Corps of Engineers use the alternative cost of privately developed steam generation as the general measure of the power benefits.

Q Are you aware, Mr. Seymour, that at the time House

Document 650 was submitted to Congress, the Corps of Engineers represented to Congress that the realizable power benefits from the projects in the Roanoke River Basin would be measured by the value of equivalent power generated by privately financed steam?

A That seems to confirm my previous statement.

Q Are you aware of that?

A I am now, sir, yes, sir.

Q Do I further understand it is your view that you do [R. 1621] not consider it necessary to fix rates to consumers of power from the Roanoke River Basin, which will ensure —and I use the word "ensure" as the point of my question— realization of those power benefits as so estimated?

A Well, you can't miss realizing those power benefits because when the power is made available from these projects to the consumers in the region, it will be made available at its value and its value is measured on the assumptions by the Army and the Corps of Engineers, on the basis of its cost from an alternative steam plant, privately developed.

Q I will put the question a little differently. You do not consider it necessary to fix rates to the consumers of power from the Roanoke River Basin which would ensure realization, in terms of dollars to the United States Treasury, of power benefits as we have defined them?

A Oh, no, sir. The benefits will accrue to the consumers of the power.

* * *

TESTIMONY OF E. ROBERT DE LUCCIA

[R. 1899] DIRECT EXAMINATION

BY MR. GATCHELL:

Q Your name is E. Robert de Luccia?

A It is.

Q Will you please state your present position and your term of service in that capacity, and give us a few facts concerning your activities?

A I am at present Chief of the Bureau of Power of the Federal Power Commission, a position that I have held since the organization of the present Bureau of Power in 1945.

* * *

[R. 1905] Q With respect to the Roanoke River and the application filed by Virginia Electric and Power Company for a license for project number 2009, when did you start your study and what have you considered?

A As a matter of fact, the Roanoke River has been before the Commission, or rather the projects proposed in relation thereto, for a good many years. As early as June 19, 1920, what was designated on the Commission docket as project number 7, a preliminary permit for application, was received by the Commission in the case of the Roanoke River Development Company. Investigations were made at that time and later other projects were applied for, projects number 602, 634, 723, 902, 916 and 1358, by various companies. The last of these, 1358, was in December, 1935.

Q You mean number 1358?

A 1358. In our investigation of the Roanoke River [R. 1906] in connection with a report such as House Document 650, that was started about nine years ago. It is House Document 650 which has been introduced here as Exhibit number 1.

We have also been concerned in connection with changes in the Philpott and Buggs Island projects. The Roanoke Rapids project number 2009 proposed in application for license as filed October 6, 1948, included a dam to be located

near Roanoke Rapids seven-tenths of a mile downstream from the site proposed for the Roanoke Rapids project in House Document 650. The proposed maximum normal pool level was at elevation 132 feet, which is five feet higher than that proposed in House Document 650.

The power house was to be integral with the dam and was to have four generating units totalling 73,000 kilowatts installed capacity. One unit was to discharge into the existing canal to the existing plant in Roanoke Rapids at elevation about 83 feet, and three units into a tailrace at elevation about 70 feet.

The Bureau of Power in its study of the applicant's proposal was aware of the conflict with the Roanoke Rapids project as proposed in House Document number 650 and made a preliminary investigation of various methods of developing the head between elevation 127 feet or 132 feet, and the elevation of Roanoke River at Weldon, which elevation is about 26 feet.

[R. 1907] These studies took into account the water requirements for fishlife and sanitary purposes, chiefly, as proposed for the operation of the Buggs Island project.

The applicant was informally advised that the Bureau of Power had some question as to the adequacy of the applicant's proposed project in view of the plan set forth in House Document 650, and in view of other possible plans of development and, as a result, a conference was held on December 20, 1948, which was attended by representatives of the applicant and the Bureau of Power and a staff member of the Corps of Engineers' Office, that is, the office of the Chief of Engineers.

During the conference various possible alternate plans were discussed and the applicant was asked to submit further engineering and cost data with regard to:

First, a plan similar to that proposed in House Document 650 but with a larger hydraulic capacity; and

Second, a plan involving a power plant integral with the dam proposed by the applicant with the tailrace elevation about 83 feet, an enlargement of the existing Roanoke Rapids canal and power plant to develop the head down to the highway bridge at Roanoke Rapids; or in lieu thereof, a dam and integral power plant just above the highway bridge at Roanoke Rapids; and, a dam and power plant just above the railroad bridge at Weldon. The applicant submitted this information in a letter dated January 11, 1949.

[R. 1908] Another conference was held on January 13, 1949, which was attended by representatives of the applicant, the Office of Chief of Engineers, the Commission's Bureau of Law and its Bureau of Power. The several plans were again discussed and the applicant's representatives indicated that they still preferred the project as proposed in the application.

During this conference in response to a question from a representative of the applicant, I stated that, if called on to report on the project as then proposed in the application, I would have to advise the Commission that the project was inadequate or at least incomplete in so far as adaptability to a comprehensive plan was concerned.

Following this conference, both applicant and the Bureau of Power studied further alternate plans and in a letter dated February 8, 1949, the applicant was asked to consider a plan which involved a longer and deeper tailrace so that a power plant at the applicant's proposed Roanoke Rapids dam could develop the full head down to the highway bridge at Roanoke Rapids and which would permit the eventual abandonment of the existing Roanoke Rapids canal and power plant.

Finally a conference was held on March 16, 1948, between representatives of the applicant, the Office of the Chief of Engineers, and the Bureau of Power during which an agreement was reached on the project as now proposed in the amendment filed April 6, 1949, to the original application for license.

[R. 1909] MR. MOORE: Right there, Mr. de Luccia, you threw a slip and said March 16, 1948. You meant 1949, did you not?

THE WITNESS: Thank you very much, I meant 1949.

* * *

[R. 1912] Q In your reports upon an application for license such as the pending application for project 2009, do you consider and report upon the adaptability of the proposed project to the general plan of development of the particular river basin within which the project would be located?

A We certainly do. This is one of the first matters to which we direct our attention, as I have just indicated.

Q In your opinion must the several projects in a river basin which are mentioned in a comprehensive plan proposed by the Army Engineers be developed by only one agency, whether that agency be public or private, federal or non-federal, in order to achieve the full benefits through operation which the comprehensive plan is designed to achieve?

A Not necessarily. As a matter of fact, we have [R. 1913-14] consistently regarded the Federal Power Act, particularly through the license conditions and requirements, as providing for non-federal construction either by state or municipal agencies, REA Cooperatives, or privately owned power companies, as protecting every public interest for which the Congress has assumed any responsibility and as providing for full coordinated operation of all projects over which the United States has control.

Further, the Commission through its licensing control and in cooperation with the Corps of Engineers, the Bureau of Reclamation and the other agencies and departments of the Federal Government can assure that operation of projects under license will be fully coordinated with federal projects to realize completely the best and most comprehensive use of a water resource.

* * *

[R. 1921] The Buggs Island, Gaston and Roanoke Rapids plants will be essentially peak load plants, if they are operated in the most efficient and economically feasible manner, or the water resources available at these sites will not be utilized as fully as possible.

Q In considering the comprehensive development of the water resources of the Roanoke River basin, in so far as concerns the water use as distinguished from the power system, in your opinion is it necessary for the United States to build and operate the Roanoke Rapids project and the Gaston project, or could the construction and operation of those projects be undertaken by non-federal interests pursuant to licenses under the [R. 1922] Federal Power Act without injury or jeopardy to any public interests of which you are aware?

A As I have previously stated, it does not seem to me that construction and operation of either the Roanoke Rapids or the Gaston projects by a non-federal agency under a Federal Power License would in any way jeopardize or injure the comprehensive development of the water resources of the Roanoke River Basin.

Q In making your studies and reports in this connection would you consider that if the Roanoke Rapids project is constructed under a license the public interest would be protected to the same extent as in the case of the Buggs Island—

project which is under construction by the United States, and would be operated by the United States?

A Yes. The United States would have full control over the planning, construction and operation of the Roanoke Rapids Project license. * * *

* * *

[R. 1924] I would have to read you practically all of Part I of the Federal Power Act in order to give you a complete list of all of those things which we have considered in connection with the license application for Project No. 2009.

* * *

Q In making your studies and reports on this application for Project 2009, did you consider that the public benefits will [R. 1925] be lost if construction is not undertaken by the United States?

A In our staff study of the application for license for Project 2009, we have given exactly the same analysis as in similar cases heretofore. We do not consider that the public benefits would be lost if construction of the Roanoke Rapids plant is not undertaken by the United States.

Mr. Seymour mentioned the reduction of the benefits to cost ratio for the Buggs Island and other projects within the river system if the Roanoke Rapids and Gaston projects are constructed by non-federal interests, but in my opinion this would in no way indicate that the public benefits would be lost.

Actually, the benefits from such a multiple-purpose project as the Buggs Island development are not recovered back into the Treasury of the United States in actual dollars. It is only the costs allocated to power which are recovered. The benefits to cost ratio is used by the Army Engineers for the sole purpose of giving to Congress a definite yardstick by which to measure the economic feasibility of a proposed development.

The costs of power are to be returned to the United States, but the costs of flood control, navigation, pollution abatement, fish and wildlife protection, land enhancement, and other incidental benefits are not expected by Congress to be repaid directly to the Treasury. Improvements such as the Buggs Island project are made for the general public welfare and the cost [R. 1926] of making the incidental benefits available to the public are not considered as reimbursable.

On the other hand, Congress has specifically stated in Section 5 of the Flood Control Act of 1944, that the rate schedules for power from such projects, "shall be drawn having regard to the recovery (upon the basis of the application of such rate schedules to the capacity of the electric facilities of the projects) of the cost of producing and transmitting such electric energy, including the amortization of the capital investment allocated to power over a reasonable period of years."

In our work of reporting upon multiple-purpose projects, we consider this mandate from Congress as placing the power benefits in a different category from the other benefits, but even the power benefits are not to be returned to the Treasury. We assume that this mandate will be carried out by the Secretary of the Interior in disposing of the power at the Buggs Island project.

If the Secretary of the Interior follows Section 5 of the Flood Control Act of 1944, as we fully expect he will, we do not see how any of the public benefits for which the Buggs Island project is being constructed, can be lost either to the United States or to the general public, regardless of who builds and operates the Roanoke Rapids and Gaston projects.

Q Did you observe the statement by Mr. Seymour, as it [R. 1927] appears on page 1606 * * *

* * *

A I cannot agree with his statement and feel that he has overlooked some vital factors which should be considered.

In the first place I think it is evident from the testimony which has been presented here that the Roanoke Rapids plant as proposed by the applicant would provide both dependable capacity and electric energy output more cheaply than an equivalent steam plant.

Furthermore, one of the primary purposes of the Federal Power Act is to secure and encourage utilization and development of water resources in a manner which would fully protect the [R. 1928] interests of the public in those resources.

If it should appear at some time in the future that the Roanoke Rapids project should be operated by the United States as a part of a federal power pool having adequate steam support, that project could of course be taken over from the licensee if it were then operating under a license pursuant to the Federal Power Act.

In the interim, the water resources which are available at this site would be utilized and thus there would be conservation of non-renewable fuel resources which would have to be consumed in the operation of a steam-electric generating plant.

Furthermore, such a development would be of material assistance now in meeting mounting power loads for all classes of customers including, among others, REA cooperatives and municipalities. Development by the Federal Government of Roanoke Rapids seems to me indefinite and possibly far in the future. To deny the area this opportunity of early development of its water resources at this site under full federal control as provided in the Federal Power Act, is, in my opinion, unjustifiable.

Q Has your bureau, or have you, submitted a report on

Project No. 2009 as proposed to be constructed by the Virginia Electric and Power Company under a license pursuant to the Federal Power Act?

A No, we have not submitted such a report. The views of the engineering staff have been stated by the three witnesses [R. 1929] who have testified in this case, Messrs. Adolph G. Sunda, Almon D. Thomas, and Dr. J. J. A. Jessel of the staff of the Bureau of Power.

Q And your testimony today?

A Yes, sir.

* * *

CROSS EXAMINATION

[R. 1931] Q Is it not true that the benefits expected to be [R. 1932] received from the original application would have been greater in proportion to cost, than the benefits expected to be received by the greater expenditure in the amended application, in proportion to cost, or do you know the answer to that?

A Not necessarily. I haven't looked into it to that extent. I would like to state, however, that the project for which modifications were suggested and which finally became the amendment of application, is the project which, in our opinion, will provide the best overall benefits in the public interest.

* * *

[R. 2157] Q Doesn't that mean that if you eliminate Roanoke Rapids, that the loss of net benefits to the United States would be $962,700 per year?

A If you never construct Roanoke Rapids that is correct, if it is never constructed by anybody.

Q You mean that if somebody else constructs Roanoke Rapids, then the United States gets that much of the net power benefits?

A The benefits are still there, Mr. Hankin.

Q I am asking you whether the United States gets it?

A I think the people of the United States still have the benefits. The project is built, the benefits are there.

* * *

[R. 2159] By Mr. Hankin:

Q Yes, on the basis of that, isn't it true that the elimination of the Roanoke Rapids project means a loss of net benefits to the United States of $962,700 per year?

* * *

[R. 2160] The Witness: This cost-benefit ratio is a purely arbitrary device which has been adopted for the purpose of indicating economic feasibility. All of the benefits are not included in monetary terms, only certain benefits which are susceptible to being put in monetary terms.

The amount of money that this sovereign corporation, called the United States, of which you speak, the net difference in the amount of money which it would receive wouldn't be changed one bit, whether it ever built Roanoke Rapids or Buggs Island, or any other project in the Roanoke River Basin, because the costs, the amounts of money which are to be received by this sovereign corporation are equal to the costs chargeable to the project, so that as a matter of receiving moneys, it is just exactly even.

Now, in so far as the benefits are concerned, they are the same. No matter who builds it, the value put upon hydro power by our very imperfect method, which we all recognize and which we deplore, but none of us has been able enough to devise a better method, is all based on the same factor—whatever it may be, I don't remember the figures exactly, but it is around $22 per kilowatt for steam. I am not attempting to be accurate as to the figure. That does not change.

* * *

[R. 2163] Q * * * Apparently, according to you, Congress did not in the Flood Control Act of 1944 determine that this project be constructed and operated by the United States, because on page 1928 of the transcript you say, "If it should appear at [R. 2164] some time in the future that the Roanoke Rapids project should be operated by the United States as a part of a federal power pool having adequate steam support, that project could of course be taken over from the licensee if it were then operating under a license pursuant to the Federal Power Act."

Will you please explain what you meant by this statement?

A Just in simple terms, I simply meant that if the United States wanted to take over the project and it was under license, that it could be so done. That is merely what I was trying to say.

* * *

[R. 2165] MR. HANKIN: Mr. Examiner, this witness must have had something in mind when he made that statement and I am asking him to tell us what he meant by it. What does he visualize by that? How can he visualize that acquisition?

CHIEF PRESIDING EXAMINER: Can you answer his question, Colonel de Luccia?

THE WITNESS: I can answer it in this way—

MR. HANKIN: Please do that.

THE WITNESS: At the end of the fifty years, for example, suppose a license was in effect and ran for a term of fifty years, at that time I think the United States or Congress—I should more preferably say Congress—has to decide then whether to do something about the project, that is, take it over and operate it by the United States, give it to another applicant or let the application be renewed, or something.

I don't know exactly what has to be done at that time. I suppose it might or might not involve money or authorization.

But the fact is that at the end of the license period some affirmative action has to be taken when the license expires. Any time in between, as I read the Federal Power Act, it says on page 16, Section 14, the last proviso there, that, "The right of the United States or any State or Municipality to take over, maintain and operate any project licensed under this [R. 2166] Act at any time by condemnation proceedings, upon payment of just compensation, is hereby expressly reserved."

My statement went to those matters.

* * * *

[R. 2186] Q You don't understand that the right to construct a project is an asset which we called a power asset? You would not call it that?

[R. 2187] A I would not call it a power asset. I guess it is a right, an asset. I don't know, I am not a lawyer. I suppose the right to do something is a good thing to have and I suppose that is an asset.

Q I see. At last we know that this is an asset. Now, if that asset is given away by the issuance of a license, because once you issue a license the United States does not have a right to construct a project at that place, does it?

MR. GATCHELL: That is a conclusion.

MR. GIBSON: I object.

CHIEF PRESIDING EXAMINER: What is your question of the witness?

BY MR. HANKIN:

Q My question is: When you take this asset away from

the United States and grant it to the Virginia Electric and Power Company would that constitute, as was stated on pages 1913 and 14 of the transcript, "protecting every public interest for which the Congress has assumed any responsibility," if the company is not required to pay to the United States an amount equivalent to the value of this asset?

A I have never understood, Mr. Hankin, that the Congress of the United States in putting into law the Federal Power Act thought that it was doing to the United States some irreparable damage. I have never understood that. This whole proceeding here is not a willy-nilly, free giving away of [R. 2188] something, this is simply a question of a licensing under this act which Congress itself has set up to protect the United States.

All of our examination, all of our consideration of this thing has been in consideration of what Congress said it had to protect and what it wanted to protect under this Act.

* * *

[R. 2204] BY MR. HANKIN:

Q Let me put it this way: Why do you think it was necessary for the applicant to show that the cost of a hydro project would be less than the equivalent steam plant?

A Oh, I don't think he had to show that, Mr. Hankin. You see, a hydro-electric plant has many things of value to it besides a mere comparison with an alternate and hypothetical [R. 2205] steam plant. The operation of a hydro plant may be used to keep up the voltage on the system, it may be used as a condenser, it may be used in many different ways. It has intrinsic values that in some places are compelling, even though its cost with an alternative steam station would show unfavorably in ratio form.

* * *

[R. 2230] Q Is it in the public interest that the economies inherent in the Roanoke Rapids project be utilized to help offset the cost of the other projects in the comprehensive plan, so as to lower the unit costs and make the rates uniform?

* * *

[R. 2231] THE WITNESS: I don't know that there is any virtue in uniform rates, Mr. Hankin.

* * *

TESTIMONY OF BEN W. CREIM

[R. 2417] DIRECT EXAMINATION.

BY MR. HANKIN:

Q Will you please state your name, occupation and business address?

A My name is Ben W. Creim. I am the Administrator of the Southeastern Power Administration, with headquarters at Elberton, Georgia.

* * *

[R. 2424] Q Has the Southeastern Power Administration already embarked upon the function of marketing power from projects under the control of the Army?

MR. MOORE: Just a moment. If it please the Examiner, we desire to object to that question. * * *

* * *

[R. 2432] MR. WHITEHEAD: Your Honor, before you recess, may I just reply to what these gentlemen have said?

CHIEF PRESIDING EXAMINER: Yes. * * *

* * *

[R. 2433] CHIEF PRESIDING EXAMINER: You need not go further, and I do not think I need to postpone a ruling in the matter.

I realize the fundamental character of the objections that these counsel have raised, to-wit, that a mere setting up of a new organization within the Department of the Interior has not changed either the Interior as a party, perhaps has not changed the basic facts, but what has been done, apparently, is that a new organization has been set up, of which Mr. Creim, the gentleman on the stand, is the head and that under the direction of the Secretary of Interior, and the gentleman in question, they have formulated a plan of operation. Is that true, Mr. Creim?

THE WITNESS: It is not quite as complete as that, but a lot of it is in the process of development.

CHIEF PRESIDING EXAMINER: But at least that is what it is intended for?

THE WITNESS: That is right.

CHIEF PRESIDING EXAMINER: You are progressing with that?

[R. 2434] THE WITNESS: That is correct.

CHIEF PRESIDING EXAMINER: What you wish to tell about is your plan, so far as you have formulated it and adopted it?

THE WITNESS: That is right, and how we intend to transmit and market this power.

* * *

[R. 2450] BY MR. HANKIN:

Q Have you made any studies or surveys as to the availability of the preferred market for power from Buggs [R. 2451] Island and other projects in the Roanoke River basin?

A We are in the process of making these studies and surveys. These studies and surveys have not yet been completed; they will be completed in the reasonably near future.

Q What do you mean by the reasonably near future?

A Approximately four or five months from now.

* * *

Q Is Exhibit 84, marked for identification, the form of application for power that you intended to send out to preferred customers?

[R. 2452] A It is.

Q I take it that you have not yet sent out these applications?

A No, we have not as yet sent them out. * * *

* * *

[R. 2499] By Mr. Hankin:

Q Suppose a license were granted for this project without requiring the applicant first to enter into such an arrangement; would you operate the Buggs Island Reservoir so as to prevent the licensee from obtaining sufficient capacity to make the project feasible?

A No, I would not.

Q Would you deprive the licensee of water which would be equivalent to the natural flow of the stream?

A I would not.

* * *

CROSS EXAMINATION

[R. 2524] By Mr. Moore:

Q In other words, what are the estimated costs you have thus far determined in regard to those transmission lines?

A We have projected several grids—

* * *

[R. 2525] The Witness: We have made several preliminary quick studies of the cost of transmission to supply

power from the Roanoke River basin, including Buggs Island and several of the other power plants that are in the plan, to several areas. * * *

* * *

[R. 2686] Q That would not be an estimate, would it?

A No, that would not be an estimate.

Let me say it this way: Consideration may have been given by staff in determining these percentages to apply to the reported loads in 1947. If the figures that I have quoted here are the same as the estimates of the municipalities, it would be a coincidence.

Q And not intentional?

A Not intentional.

[R. 2687] Q Because you made your own estimates for '55 and subsequent years?

A This entire group of conclusions that we have drawn here comes from that formula that I repeated yesterday, the only variation in the formula being as to the starting point. We endeavored to gather together the best information we have in our files, plus what was available here in Washington, readily available.

Q By "in Washington," what do you mean?

A I am reasonably sure that some consultation on the part of our staff was made with the FPC records downstairs. I know they have been coming over here, somebody has been over here almost every day for several months, looking at the annual reports for this information and that information, not only on these loads but other information.

I don't want to give the impression that these estimates reflect the views and viewpoints of anybody in North Carolina and Virginia. They represent the viewpoints of Southeastern as a load that we can reasonably expect, that South-

eastern can reasonably be expected to ask to serve. In other words, we went through this operation for one purpose—and it is a quickie, not any detailed, elaborate load forecast going into all of the details that you have asked about previously. The purpose of this study was to give to me, as Administrator, a quick estimate as to what the probability of the preference [R. 2688] agency power market in the Roanoke River basin area will be from now until about 1970, so that I could use it as a measure of the requirements of preference agencies, and what they, in our judgment, would be coming to our office and asking for in the way of power service.

Q When was that study started, and when was it completed?

A This particular tabulation was gotten together and completed here in the last two or three weeks, I would say just in preparation for this particular hearing. We have been working on this data ever since Southeastern got started, and a lot of it was in the files of the Division of Power previously.

* * *

[R. 2723] Q Would not a normal utility system load have a load curve which was an irregular line at the top, rising usually on week days, and peaks which become narrower as they reach the top?

A I would prefer to say it this way: That the normal utility load is a non-regular line, it is irregular, and the shape of the irregularities vary with the systems, vary with days, and the kind of service that they give.

[R. 2724] The nature of the peaking on the load curve I don't think is uniform throughout the systems.

Q Have you examined Exhibit 29 in this case?

A What is Exhibit 29?

Q That is called the Charles T. Maine Report. It has a good many pages in it.

A No, I am sorry; I have not examined it. I may have looked at it.

* * * *

[R. 2725] Q Did you use this exhibit in the preparation of your Exhibit 87?

A No, sir. No, so far as I know, no reference was made in my testimony—this is Exhibit 29?

Q Yes.

A —to Exhibit 29. The exhibit number that we used on No. 87 was Exhibit 74. That is, in preparing Exhibit 87, the only exhibit that was used in making these calculations was Exhibit 74.

Q Thank you for restating that, but you have answered my question, that you did not use Exhibit 29 in making up [R. 2726] Exhibit 87.

A We did not.

Q Looking at this load curve, is it not true that the tall peaks, while requiring considerable capacity in the system generation to support them, nevertheless capacity which would meet the loads in the upper portion of these peaks would require far less energy than continuous operation at that capacity?

A That's right.

Q On this load curve, have you observed that there are tall, slender peaks which can be scaled as reaching up for as much as 100,000 kilowatts of a relatively short duration?

A Yes. They are here at around 6:00 p.m. of Monday through Friday.

Q To carry such a load described by this exhibit in a case where most of your system generation is steam, except for a 96,000 kilowatt capacity hydro project, would you not operate that project up in these peaks before you on this exhibit if you do not have flow and energy for continuous operation at that capacity?

A It would be prudent operation to operate the hydro plant on the peaks, if you did not have sufficient water to run over long, extended periods of time.

Q Is it not true that so operated up in the peaks, a hydro project could produce 96,000 kilowatts of capacity on [R. 2727] the system load without nearly as much energy as would be required for continuous operation at that capacity?

A Well, that's obvious, because the volume of energy or of water which makes energy is directly proportional to the time in which the generator is in operation. If it takes X quantity of water for one hour, it will take 2X for two hours or 3X for three hours.

* * *

Q The higher you place the operation of that hydro plant in the load curve, the less energy is required to provide that capacity; isn't that correct?

A That's correct.

Q Have you made any effort to check, from this Exhibit [R. 2728] No. 29, either before or after preparation of your Exhibit 87, what would be the minimum energy required to provide 96,000 kilowatts of capacity?

A For how long?

Q My question is—

A No, I haven't made any check, but I might be able to answer the question without having made a check. It would take 96,000 kilowatt hours per hour of energy, converted

back to water. I haven't made any checks as far as Exhibit 29 is concerned.

Q You have not undertaken to determine from Exhibit 29, the upper limit on the load curve at which the Roanoke Rapids plant, including the existing plant, could operate and still provide 96,000 kilowatts of capacity?

A No, we did not.

Q And you have not made any effort to determine from that exhibit the minimum flow and energy requirements for the project, including the existing plant, to afford 96,000 kilowatts of capacity dependable on the applicant's system load, for the week of annual peak load in December, 1953?

A No, we haven't done that.

Q Are you familiar with Exhibit 61, filed in this case?

A Yes.

Q It is an exhibit entitled "Operation of Project No. 2009 and Existing Plants at Roanoke Rapids Carrying Load [R. 2729] Above 624 mw in Week of Annual Peak of 720 mw in December, 1953."

A Yes.

Q Have you made any effort, in preparing or checking Exhibit 87, to determine the flow and energy required for the operations proposed by this Exhibit 61?

A Not quite like that. We gave consideration to Exhibit 61 as it reflected operation in comparison to Exhibit No. 74. We made no calculations in so far as operation under Exhibit 61 is concerned.

* * *

[R. 2731] By Mr. Gibson:

Q In the preparation of Exhibit 87, I understand you have assumed the operation described by Exhibit 74?

A That is right; that is one of the assumptions.

Q That was one essential to the ultimate figures, was it not?

A That's right.

Q In doing so, did you determine where on the load curve the operation described by Exhibit 74 was placed?

THE WITNESS: May I have that question read, please?

(The question was repeated by the Reporter.)

THE WITNESS: You mean on the system load curve?

BY MR. GIBSON:

[R. 2732] Q That is correct.

A No, I did not.

* * *

BY MR. GIBSON:

Q Did you undertake to determine how much of the load curve Exhibit 74 would be carrying?

A What proportion of the total load curve?

Q No. Perhaps I can put it this way:

Did you undertake to determine at what band on the company's system load curve you would find enclosed the energy produced by the operation described in Exhibit 74?

A I said we did not.

Q You did not?

A No.

[R. 2733] Q You did not undertake to determine whether the load carried by the operation described in Exhibit 74 was only the load at the very peaks of the system peak load?

A No, we didn't determine it at the top, the middle, or the bottom. It was of no materiality to the study.

Q Did you determine whether or not that operation

could have been placed higher on the load curve than assumed by Exhibit 74?

A No. I didn't make that study.

* * *

[R. 2734] Q You have not made a study to determine what, in fact, would be the energy requirements to make 96,000 kilowatts of capacity dependable on the company's system load?

A On the company's system load?

Q Yes.

A No; I haven't drawn any conclusions or made any study as to that.

* * *

[R. 2735] By Mr. Gibson:

Q Is it not perfectly apparent from an inspection of Exhibits 61 and 74, that far less energy is required for the operation described by Exhibit 61 than for the operation described by Exhibit 74?

A That's correct.

* * *

[R. 2740] Q Is Exhibit 74 a necessary measure of the load that has to be carried to be dependable on the 1953 VEPCO load for the week of annual peak load in December?

The Witness: Would you repeat that?

(The question was repeated by the Reporter.)

The Witness: It is one measure. There could be others.

By Mr. Gibson:

Q There could be less energy requirement, could there not, for that purpose?

A That's right.

* * *

[R. 2819] Q You recognize there is a relatively small amount of energy consumed in the operation described in Exhibit 61?

A I didn't make the calculation, but I know it is less than in 74.

Q It is true, is it not, that the additional energy from additional flow will ultimately be provided by the water coming down the river?

A That's another story; yes, that is probable.

Q Did you understand that Exhibit 61 gave a measure of the energy requirements of the plant in order to provide the capacity dependable upon the system load in the critical week of December, 1953?

A I didn't understand it as that; it might be.

* * *

Order of December 12, 1950, of the Virginia State Corporation Commission, Case No. 9555

* * *

[R. 6139; *26*] We accordingly find as a fact that the co-ops will save at least $20,000,000 if they buy from Vepco instead of from Old Dominion. * * *

* * *

[R. 6157; *44*] In passing on this application for authority to borrow sixteen million dollars, our specific duty under the law is to look out for the welfare of the 55,000 customers of the eleven co-ops. The interest of those consumers in getting the best possible service at the lowest possible cost constitutes the public interest here involved. The proposed borrowing is not reasonably necessary for the purpose of promoting that interest. On the contrary, it would result in greater cost to the extent of more than twenty million dollars in thirty-five years, without providing better service.

* * *